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UNITED STATES FEDERAL COURT

FOR THE WESTERN DISTRICT OF OKLAHOMA

Docket No. CIV-84-2777R

BETTY ANN MARSEE, AS ADMINISTRATRIX OF THE ESTATE OF MARVIN SEAN MARSEE, DECEASED,
Plaintiff

vs.

UNITED STATES TOBACCO CO., A NEW JERSEY CORPORATION,
Defendant

DEPOSITION of PRAKASH CHANDRA GUPTA, Ph.D., a witness called by and on behalf of the Plaintiff, taken pursuant to the applicable provisions of the Federal Rules of Civil Procedure, before Rebecca L. Bissonette, Registered Professional/Certified Shorthand Reporter and Notary Public in and for the Commonwealth of Massachusetts, at Austin Hall, Harvard Law School, Cambridge, Massachusetts, on Thursday, May 9, 1985, commencing at 9:30 a.m.

APPEARANCES:

Braly & Braly (by George W. Braly, Esquire, and Dania Deschamps-Braly, Esquire), 217 North Mississippi, Ada, Oklahoma 74820, on behalf of the Plaintiff.

Wright, Lindsey & Jennings (by Alston Jennings, Esquire), 2200 Worthen Bank Building, Little Rock, Arkansas 72201, on behalf of the Defendant.

ALSO PRESENT: Andrew M. Coats, Esquire
Timothy M. Finnegan, Esquire
John A. Ciraldo, Esquire

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I N D E X

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PROCEEDINGS

MR. BRALY: We're on the record, and my name is George Braly.

This deposition is being taken by notice with a subpoena served on the witness.

I would propose for stipulations today that we adopt what we consider to be the normal stipulations of waiving all objections except as to form of question.

I would ask that counsel consider that there's a high probability that this deposition will be used at trial. If they have any objections that can possibly be corrected by additional foundation or other matters, that they raise them and afford me an opportunity. That's all I would have.

MR. JENNINGS: We will stipulate that all objections are reserved except objections as to the form of the question. We're not agreeing that if we don't make an objection to the form of the question that we waived it, but we certainly will do everything possible to accommodate you in that regard.

MR. BRALY: As a matter of fact,

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I'd like to correct that.

We have in our previous depositions agreed to waive these objections until the time of the pretrial, the last pretrial conference. If they can be worked out that way, I would propose we do it that way.

MR. JENNINGS: No objection. I so stipulate.

MR. BRALY: In addition, the deposition is being filmed by video tape by the agreement of counsel, being Mr. Ciraldo and myself, and we do propose to use the video tape at the time of trial.

We do not anticipate moving the video camera, however we have a couple of exhibits today that we may ask the camera to take a closeup photograph of the exhibits for the purpose of the deposition.

Is that satisfactory?

MR. JENNINGS: Yes.

MR. BRALY: Having said that, you may swear the witness.

PRAKASH CHANDRA GUPTA, Ph.D., having duly affirmed that his testimony would be the

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truth, the whole truth, and nothing but the truth, testified as follows in answer to direct interrogatories by Mr. Braly:

Q. (BY MR. BRALY) Would you state your full name, please.

A. My name is Prakash Chandra Gupta.

Q. And where do you live?

A. I generally live in [DELETED]India.

Q. Where are you living at the present time?

A. At present time living in [DELETED]

Q. Now, sir, I notice that you speak English with a foreign accent. I will ask you to speak slowly and as clearly as you can. Don't be alarmed if the court reporter has to interrupt to ask you to repeat, and I may do so myself. Okay?

A. Okay.

Q. Where -- what educational background do you have, sir?

A. I have had basically science education at undergraduate level. I had my Master's degree in statistics from the University of Bombay. I have my Doctor of Science degree in epidemiology from the Johns Hopkins University, Baltimore, Maryland.

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Q. Here in the United States?

A. Here in the United States.

Q. Do people customarily call you Doctor Gupta?

A. Yes. I'm entitled to that.

Q. I will so call you.

Doctor Gupta, when did you receive your Master's degree in statistics from the University of Bombay?

A. I received it in 1965.

Q. And at the time or after you received that degree how were you employed?

A. After I received my Master's degree, I was employed for a short while as a lecturer in statistics in a college in Bombay.

Q. And after that how were you employed, sir?

A. After that I was employed as a statistician in a research project in Bombay. The research project was on cancer of the mouth and precancerous lesions of the mouth and effects of tobacco habits.

Q. Where was that research conducted?

A. It was conducted in different parts of India.

Q. Were you associated with any institution or

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foundation or such similar --

A. Yes. I was employed by the Tata Institute of Fundamental Research, which is at Homi Bhabha Road in Bombay. It is a national center of the government of India for the -- for research. And the project was conducted by the Tata Institute of Fundamental Research.

Q. Now, tell me what year you came to the United States to study for your doctorate degree in epidemiology.

A. I came here in 1972 to study as a student for Doctor of Science in epidemiology.

Q. When did you receive that degree?

A. 1975.

Q. And since 1975 where have you been employed?

A. I have been employed since October 1, 1966, in the Tata Institute of Fundamental Research. I came to do my Doctor of Science on the leave from Tata Institute, and as soon as I finished my degree requirements I went back with the Tata Institute of Fundamental Research.

Q. And did I hear you state that you are presently employed at the Harvard University here in Cambridge?

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A. I'm invited to Harvard University as a Takemi Research Fellow in international health. I hold the appointment as a Takemi Research Fellow at Harvard University at the Harvard School of Public Health.

Q. Now, sir, have you had occasion to read the Complaint that has been filed in this case?

A. Yes, sir.

Q. Are you generally familiar with the allegations involved as they relate to oral cancer in this case?

A. Yes.

Q. What experience or research have you conducted that you feel might help a jury understand the evidence or the questions of fact that are involved in this lawsuit?

A. I have been associated with the research on the habits of tobacco usage, tobacco chewing and tobacco smoking, which are widely prevalent in India, and I'm associated with those studies, studies, which have involved examination and interview of over 200,000 individuals and a follow-up examination of a portion of these individuals.

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Q. Are you a member of any scientific associations or professional associations?

A. I'm a fellow of the American College of Epidemiology.

Q. You're a -- you're a citizen of the country of India?

A. That's right.

Q. How did you come to be a fellow of the American College of Epidemiology?

A. This American College of Epidemiology was formed very recently, just two or three years back, and it was initiated by Professor Lilienfield, who is a very well-known figure in the United States. And I thought that it a -- the object is stated as furthering the interests of epidemiology and epidemiologists. I thought it would be a good thing if I join it.

Q. Sir, what is the Tata Institute of Fundamental Research? Tell me how to pronounce it, sir.

A. Tata Institute of Fundamental Research. It is an institute which solely is devoted to research. It takes postgraduate students, doctoral degree students also.

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Q. Doctor Gupta, tell me briefly what the science of epidemiology is.

A. The science of epidemiology deals with the study of diseases in human, I like to think of it as a counterpart to medicine, which deals with the study of diseases in a specific human individual, how it happens in an individual, how it progresses and how it can be cured.

Epidemiology is the same thing but not in an individual, but in a group of individuals, in a group of population, how the disease has occurred, how it progresses, how it can be cured, how it can be prevented. That to me is the basic object of the science of epidemiology.

Q. What kinds of studies or research do epidemiologists commonly conduct?

A. They conduct a variety of studies and research. The most common ones I would say are the studies which relate to finding out the causative factors or risk factors of disease, and there are various kinds of studies by which they do this.

Q. Can you give me some examples?

A. Yes. There are case-control studies, there are cross-sectional studies, there are cohort

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studies and there are intervention studies.

Q. Have you ever done any work with or for the World Health Organization?

A. I have been associated as a consultant to the World Health Organization.

Q. And in what connection have you been associated as a consultant for that organization?

A. I've been associated as a consultant for meetings which were organized by the World Health Organization, and when I visited them I was there for a couple of days conferring with them.

Q. Is there any part of or division of the World Health Organization that concerns itself with the study of cancer?

A. Yes. There is a small unit involved in the organization which is known as Cancer Unit, and there is a large institute within the body of World Health Organization, but sort of having an independent existence, which is solely devoted to the research on cancer. That is known as International Agency for Research on Cancer.

Q. Now, this International Agency for Research on Cancer, is there a shorthand name or an acronym for that?

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A. Just the initials of them form I-A-R-C, and it's commonly known as IARC or IR.

Q. Do I pronounce it correctly if I call it IARC?

A. That's fine.

Q. Are you a member of any of the committees of IARC?

A. I have been a member of a couple of committees in IARC. I was a member of a scientific committee to examine some of their research projects with the purpose -- that they were proposing to conduct in different parts of the world. And I was also a member of their committee to examine the evidence for the carcinogenicity of betel quid with tobacco and chewing tobacco as it exists in India and Southeast Asia for humans.

Q. Doctor, the plaintiff in this lawsuit is alleging that the use of oral tobacco has caused cancer. From the kinds of studies that you have described to us is it possible for scientists to determine a cause-and-effect relationship between, for example, in this case, the use of oral tobacco and oral cancer?

A. Yes. On the basis of studies

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conducted and reported in the scientific literature over the past almost ten decades it is possible to conclude that oral use of tobacco is a causative factor of oral cancer.

Q. Now, can this be done from epidemiological studies?

A. Yes. It can be done and it has been done from epidemiological studies.

Q. Is it possible to reach such a conclusion solely from epidemiological studies?

A. I believe that a cause-and-effect relationship among humans is possible to conclude only from epidemiological studies among humans. Especially when we have human beings, unfortunately, who are exposed to these risk factors, we need not go to anyone else or any other kind of study to establish cause-and-effect relationship among humans.

Q. Sir, have you reviewed the literature, medical and scientific literature, with respect to the use of oral tobacco and oral cancer?

A. Yes. I have reviewed this literature.

Q. Now, you are from India and most of your work has been done in India; is that correct?

A. That is right.

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Q. Will you tell us a little bit about the usage of oral tobacco in India, how is it used, for instance?

A. Yes. Oral tobacco -- tobacco is used in India in a wide variety of ways. It is used by itself; also by certain segments of population it is used along with lime, a mixture of tobacco and lime which is sometimes referred to as khaini; and it's commonly used as an ingredient in the betel quid. The betel quid consists of a betel leaf, which is a leaf from a vine, lime, which is often from lime stones or seashells, and pieces of areca nut. Tobacco is almost always an ingredient of this betel quid.

Q. If I understand you, you are telling me somebody takes a betel leaf, a leaf from a plant?

A. That is correct.

Q. And they sometimes mix that with other ingredients, which you described as lime and tobacco?

A. They put little bit of lime on the leaf, they put pieces of areca nut, and they put some tobacco on it and they take it in the mouth.

Q. Do they hold it in the mouth?

A. They hold it in the mouth. They chew

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on it. When they have held it for 15, 20, 30 minutes, they spit it out.

Q. Now, is tobacco a plant that is native to the country of India?

A. No. Tobacco was brought to India from the United States by the Portuguese in about seventeenth century.

Q. In the 1600's then?

A. That's right.

Q. Now, is this habit of the use of tobacco in India, is this a common habit?

A. It is a very common habit.

Q. From your studies can you tell us what portion of the population engage in this practice of using oral tobacco?

A. Yes. As I said --

MR. JENNINGS: Excuse me. I want to show an objection to the form of the question. "Oral tobacco," I'm not sure I know what that means.

MR. BRALY: Okay.

Q. Doctor Gupta, do you understand what the word "oral tobacco" means as I've been using it?

A. Yes.

Q. Would you tell us what you understand that

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word to mean?

A. I understand by the use of oral tobacco, taking of tobacco of any form in the oral cavity.

Maybe, as I said, in different parts of India and maybe different parts of the world, tobacco is used in many, many different ways. But epidemiologically or medically the effect -- the effect of taking tobacco in the mouth have been found to be uniform. So for the purposes of discussing the effect of use of tobacco, it's more convenient to refer to it as a use of oral tobacco rather than a use of a specific kind of tobacco.

Q. Now, can you tell me how common this habit of the use of oral tobacco is in India?

A. In our extensive house-to-house studies of rural Indian population, we have found that about 26 or 28 or 30 percent of individuals only use oral tobacco, that chew tobacco. There are additional percentage of individuals who may chew as well as smoke and those who may smoke only. If you combine all these, the percentage may range from 60 percent to 80 percent. Here I'm talking of the individuals who are fifteen years and older.

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Q. So if I understand your breakdown correctly, that you are saying that approximately 60 to 80 percent of the population uses tobacco in some form, smoking or oral tobacco, and that some part of that population uses both of those forms of tobacco?

A. That is correct. A2

Q. Now, sir, you described this habit of oral tobacco as including limestone and parts of a nut or a plant. I believe you called it an areca nut?

A. A betel nut, yes.

Q. For the benefit of the court reporter, could you spell those two, please?

A. It has been referred in the literature very often as betel nut, b-e-t-e-l, n-u-t. But the correct name for it should be areca nut, because nut comes from areca palm.

Q. Could you spell that

A. A-r-e-c-a. Areca nut.

Q. So if we refer to betel nut or areca nut, we're talking about the same thing?

A. That's right.

Q. Now, have you conducted any research or studies or review of the literature with respect to trying to determine what part of this betel quid is

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responsible for or associated with oral cancer?

A. Yes. That is an interesting question because to those who have been working in this field and those who have read the literature, it has been clear from all the literature that it is tobacco in the quid which is the -- which is really the etiological factor, which is the cause of oral cancer, but it has not been clear to persons who have not -- who are not working in the field but just sort of acquainted to it. And therefore I tried to review the literature systematically to find out whether it is areca nut or some other complement of the quid which could be considered as carcinogenic or whether it is tobacco.

I made this literature review and published a paper on that.

Q. Before we get to your paper on that subject, Doctor Gupta, is oral cancer a problem in India?

A. Oral cancer is the major cancer problem in India. It constitutes the most common form of cancer in almost all of India except in some very few areas.

Q. Now, how does that compare with other parts of the world?

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A. In India the frequency of oral cancer from all the reported literature is that 40 to 50 to 60 percent of all cancers are oral cancers. Compared to that, in United States and western countries, about 2 percent to 3 percent maybe 4 percent of all cancers are oral cancers.

Q. Would it be an accurate statement to say that percentage-wise, a fraction of all the cancers, that you maybe have as much as ten times or more oral cancer in India as they do in western countries?

A. That is true, although it will be better to compare -- take the ratio of incidence rates. And the incidence -- frequency is the -- out of all oral cancer, these many are oral cancer.

Incidence is the number of oral cancer, new oral cancer arising in the population. When we compare the incidence figures, it makes even more clearer that oral cancer is the most common form of cancer in India. Because the oral cancer rates in the United States are generally around 1 and 2, between 1 and 2 per hundred thousand per year, whereas in India there are upwards of 20 per hundred thousand per year, 20 cases of oral cancer per hundred thousand.

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Q. Are you telling me in India out of every hundred thousand persons in the population you are going find about 20 oral cancers in the year?

A. That is right.

Q. And that in the United States or other western countries in the neighborhood of 1 to 2 per every hundred thousand citizens of those countries?

A. It's not quite as simple as that because we are comparing the incidence rates of the two countries, we have to adjust for age. Now, United States has a lot more older people than India. If you take hundred thousand persons, there are many more older persons, the rates may be affected that way.

Q. So you might want to adjust the figures for an age factor, but are those the right ballpark numbers?

A. Right. When I said that I adjusted for age.

Q. Doctor, you said you wrote a paper on that. When did you write that paper?

A. I wrote that paper in 1982.

MR. BRALY: Let me ask the court reporter to mark this as defendant's deposition

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Exhibit 1.

("Comparison of Carcinogenicity of Betel Quid With and Without Tobacco: An Epidemiological Review," was marked Plaintiff's Exhibit No. 1 for identification.)

Q. Doctor Gupta, let me hand you what has been marked as the defendant's deposition Exhibit No. 1 and ask you if can identify that document.

A. Yes. It is the same document which I am referring to.

MR. BRALY: Excuse me. We've got that marked as a defendant's exhibit. Show it marked as plaintiff's Exhibit No. 1.

Mr. Jennings, why didn't you speak up and correct me?

MR. JENNINGS: I wasn't listening.

MR. BRALY: I ask the court reporter to re-mark the exhibit and we'll identify the exhibit.

Q. Doctor Gupta, we'll try this one more time. It's been re-marked as plaintiff's deposition Exhibit No. 1. Is this the paper you were referring to?

A. Yes. This is the paper I was

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referring to.

Q. Thank you, sir.

What is the title of that paper?

A. The title of the paper is "Comparison of Carcinogenicity of Betel Quid With and Without Tobacco: An Epidemiological Review."

Q. Was this paper published in the medical or scientific literature?

A. Yes. It was published in a journal with the high standard of peer review.

Q. What is that journal?

A. The name of the journal was "Ecology of Disease" published and printed in Great Britain.

Q. What year was it published in?

A. It was published in 1982.

Q. Now, sir, do you have an opinion as to whether or not the betel quid or any of the other ingredients besides the tobacco are responsible for the high incidence of oral cancer in India?

A. Yes. After conducting my literature review study, I have come to the conclusion that it is tobacco in the quid which is responsible for high incidence of oral cancer in India.

Q. Are you familiar with the term "relative

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risk"?

A. Yes. I use it all the time.

Q. And what does the term "relative risk" mean in the science of epidemiology?

A. A relative risk simply means an enhanced risk. To give an example, if I say, for example, that a relative risk of oral cancer among betel chewers, betel chewers with tobacco is ten, it simply means that if I take a group of persons with the habit of chewing betel quid with tobacco and another group of persons without the habit of chewing betel quid with tobacco, then over the time period the number of oral cancers which will develop in this group with tobacco -- with the habit would be ten times the number of oral cancer cases which would develop in that group.

Q. Have you been able to determine the approximate relative risk of persons who use oral tobacco in India for developing oral cancer?

A. Yes, I have worked on those estimates.

Q. And in your opinion what are the approximate numbers for relative risks for persons using oral tobacco in India?

A. These relative risk estimates, of

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course, vary a little from study to study, but generally they are very high and the relative risk estimates range from 4 for the study, 3, 4 from the study, to about 50 or 60 in the specific subgroups.

Q. How long has the medical literature been discussing the subject of tobacco and oral cancer in India?

A. I have not really done a lot of historical survey of this particular problem, but in my general readings on the subject I have noted that there are definite papers and literature reports dating back to late nineteenth century, so it's almost hundred years, I would say, since the literature -- just knowing the literature that there is association between use of betel quid and tobacco and oral cancer.

Q. Have there been any case-control studies done on this subject?

A. As a matter of fact, one of the first case-control studies to be ever done on any disease probably was done on oral cancer. It was done in 1933 by a surgeon named Ian Morison Orr and was reported in "Lancet," L-a-n-c-e-t. That's the name of a medical journal.

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Q. Doctor Gupta, you referred to a medical journal by the name of the "Lancet"?

A. That's right.

Q. How is that journal regarded as among scientists and people who study the subject you studied?

A. That is generally regarded as the most authoritative journal in the field of -- in the medical field.

Q. Now --

MR. BRALY: I ask the court reporter to mark this document as the plaintiff's deposition Exhibit No. 2.

("Oral Cancer In Betel Nut Chewers In Travancore" was marked Plaintiff's Exhibit No. 2 for identification.)

MR. JENNINGS: May I?

MR. BRALY: Sure.

A. I would --

Q. Just one moment, doctor. They are looking at the exhibit.

Doctor, let me hand you what the court reporter has marked as plaintiff's deposition Exhibit No. 2. Can you tell me what that document

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is?

A. Yes. It is the same paper which I am referring to.

Q. By Doctor Orr?

A. Doctor Orr. "Oral Cancer in Betel Nut Chewers in Travancore: Its Etiology, Pathology and Treatment."

Q. Doctor, tell me again what year that was published?

A. It was published in 1933. I may just quote one line from that paper and -- which is a sort of conclusion of that paper written in 1933, which says that the evidence, "evidence" is my word, but it is implied, the evidence seems to exonerate the betel leaf and areca nut from the accusation of being a carcinogenic substance.

Q. Now, since 1933 can you give us some idea of what the medical literature has reported with respect to the use of oral tobacco and oral cancer in India?

A. There have been a number of studies from 1933 onwards, particularly in 1940's and '50's. There was a lot of work done in this area by Doctor Khanolkar, K-h-a-n-o-l-k-a-r. Doctor Khanolkar from

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Bombay was a very eminent cancer surgeon. He collected his data not only from Bombay but from all parts of India, and he published them. Looking at his data, reading his papers, one would come to the conclusion that it was tobacco which was really responsible for high incidence of oral cancer in India, and Doctor Khanolkar also came to the same conclusion in his papers.

Q. What decades was this taking place when these conclusions were reached?

A. These papers were generally written in 1940's and '50's.

Q. Now, can you -- have you formed a conclusion with respect to the question of whether or not the use of oral tobacco causes cancer?

A. Yes, I have. I believe that oral tobacco causes oral cancer.

Q. As among yourself and the scientists that you work with, when was that conclusion first reached?

A. I would say that -- as I said, I started working in this field completely -- I was involved in this field from the date 1 October, 1966; and I went through the literature and studies were

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coming out, and by the time of 1968 or '69 to me it would seem that there was almost a unanimous opinion that oral use of tobacco was the cause of oral cancer.

Q. Are there any particularly noteworthy studies from the 1960's or early 1970's on this subject?

A. Yes. There are case-control studies published from Madras by Shanta and Krishnamurty.

Q. The court reporter will need some help with that.

A. Shanta and Krishnamurty, K-r-i-s-h-n-a-m-u-r-t-y. They published a series of case-control studies, and then in '60's the World Health Organization requested one epidemiologist, Doctor Hirayama, to conduct a series of case-control studies.

Q. Excuse me one second. Could you spell Doctor Hirayama's name for the benefit of the court reporter?

A. H-i-r-a-y-a-m-a.

Q. You were saying that the World Health Organization asked him to conduct some studies?

A. Yes. They asked him to conduct a

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series of studies in India and Ceylon to find out exactly the role of tobacco and oral cancer.

Q. Are there any other studies other than the ones conducted by Doctor Hirayama?

A. In '60's, again, there were -- there are many case-control studies in the literature. I mention only a very few of them which I believe to be rather good.

Then there was a population-base study, very large population-base study, again conducted under the sponsorship of the World Health Organization in the Mainpuri District of India, M-a-i-n-p-u-r-i, district of India, where the incidence of oral cancer was thought to be very high.

MR. BRALY: I ask the court reporter to mark this document as plaintiff's deposition Exhibit 3.

("The Epidemiology of Oral and Oropharyngeal Cancer" was marked Plaintiff's Exhibit No. 3 for identification.)

Q. Now, Doctor Gupta, I hand you what the court reporter has marked as plaintiff's deposition Exhibit No. 3. Can you identify that document, please, sir?

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A. Yes. This is the report of a population-based study in the Mainpuri District to which I refer.

Q. Is this the document you were just referring to by Doctor Wahi?

A. That is right.

Q. And when was this published?

A. This was published, I believe, in 1968.

Q. Is the publication of such a study in the bulletin of the World Health Organization a publication and authoritative journal?

A. Yes. It is a very authoritative study published in that journal.

Q. Doctor, you mentioned case-control studies and cohort studies. Would you very briefly describe what you mean by a case-control study?

A. Yes. In case-control studies one identifies and collects the cases of disease after they are diagnosed, and then one collects a reference group or a group for comparison purposes.

One measures various characteristics of the disease cases, one measures various characteristics of the reference group, also known as control group, and then compares them to

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find out what are the differences.

In cohort study one takes a group of individuals, or rather two groups of individuals, one with a characteristic which we want to study, for example, use of tobacco, and another without the characteristic, and then follow them over a period of time. Then one sees how many disease cases end up in this group and how many disease cases end up in that group. To begin with the disease cases in both groups need to be excluded.

Q. Doctor, are you familiar with a study done by -- I'm going to have to try at the name -- Jussawalla?

A. Jussawalla.

Q. J-u-s-s-a-w-a-l-l-a?

A. That is right.

Q. A study with the title "Evaluation of Cancer Risk in Tobacco Chewers and Smokers: An Epidemiological Assessment"?

A. I'm familiar with that study.

Q. Do you recall about when that study was done?

A. I think it was published in 1971.

MR. BRALY: Let me ask the court

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reporter to mark this as plaintiff's deposition Exhibit 4.

("Evaluation of Cancer Risk in Tobacco Chewers and Smokers: An Epidemiologic Assessment" was marked Plaintiff's Exhibit No. 4 for identification.)

Q. Doctor Gupta, let me hand you what the court reporter has marked as plaintiff's deposition Exhibit No. 4. Can you tell us what that document is, sir?

A. Yes. This is the same document we were referring to.

Q. By Doctor Jussawalla?

A. By Doctor Jussawalla and Deshpande.

Q. Now, is the journal entitled "Cancer" familiar to you?

A. Yes. This "Cancer" is probably the most authoritative journal in the field of cancer research, in the field of cancer in general.

Q. Is that where this study was published?

A. Yes. It was published in "Cancer."

Q. Do you consider the journal in this study to be reasonably authoritative?

A. I think it is one of the finest

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case-control study that has been published on this particular topic. It is very sound methodology and very sound estimates of relative risk.

Q. Doctor, there is a statement made in the abstract of this report. I'd like to see and ask if you agree with this statement. It says, "This cause-and-effect association is probably as intimate as that of cigarette smoking in lung cancer," referring to the use of oral tobacco and oral cancer.

Do you agree with that assessment?

A. I entirely agree. The oral use of tobacco -- the relationship between oral use of tobacco and oral cancer is as close as the relationship between cigarette smoking and lung cancer, maybe closer.

Q. Doctor, we've talked about studies that other persons have conducted. Have you personally been involved in any studies?

A. Yes. As I said, I have been involved in the studies from 1956 involving several hundred thousands of persons in different parts of India where we have examined individuals in house-to-house surveys. We have questioned their tobacco habits and we have examined their mouths and these

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examinations have been carried out by specially trained dentists.

Q. And has this been done through the Tata Institute of Fundamental Research?

A. Yes. These studies have been done under the Tata Institute of Fundamental Research.

Q. Where has the funding come from for those studies? What's been the source of the funding for the studies?

A. Our studies have been funded by the National Institute of Health USA, under Public Law 480, Research Grants.

Q. Is that Public 480, Research Grants?

A. That's right.

Q. From the National Institute of Health in the United States?

A. That's right.

MR. BRALY: Mark this document as plaintiff's deposition Exhibit 5.

("Incidence Rates of Oral Cancer and Natural History of Oral Precancerous Lesions in a 10-year Follow-up Study of Indian Villagers" was marked Plaintiff's Exhibit No. 5 for identification.)

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Q. Doctor Gupta, I hand you what the court reporter has marked as plaintiff's deposition Exhibit No. 5. Can you identify take document, sir?

A. Yes. This is a -- one of the papers published by our study.

Q. Who are the authors of that study?

A. The author of this -- I'm the principal author and all the co-workers who worked on the studies are on that list.

Q. I'm not going to burden the court reporter by asking you to name them all, but they are all reflected on the face of the paper; is that correct?

A. That is right.

Q. For the purpose of identification, would you read the title to the court reporter?

A. "Incidence Rates of Oral Cancer and Natural History of Oral Precancerous Lesions in a 10-year Follow-up Study of Indian Villagers."

Q. Doctor Gupta, you earlier testified that you thought the cause-and-effect relationship between oral cancer and the use of oral tobacco was understood by the late 1960's; is that a fair summary of what you said?

A. Yes. That is a fair summary.

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Q. What kinds of research on this subject did you attempt to conduct after you and your fellows at the Tata Institute of Fundamental Research had reached that conclusion?

A. Yes. We were more interested in finding out how did the oral cancer develop from the tobacco habits. Knowing that oral cancer and tobacco habits were related, what came -- what was the natural history.

It was known in the literature that oral cancer was often preceded by certain lesions, certain abnormalities in the mouth, and these abnormalities were termed as precancerous lesions.

Q. Are you saying anomalies in the mouth or abnormalities?

A. Abnormalities. Therefore, we made our focal point of investigations as these precancerous lesions, the most common of them is leukoplakia and I will just refer to it as leukoplakia. We wanted to study was how often does leukoplakia occur in the population, how the leukoplakia was related to the habit of tobacco chewing and smoking of tobacco and how does leukoplakia and other lesions progress to

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oral cancer.

In our cross-sectional studies which encompassed --

Q. Excuse me one second.

(Short pause.)

Back on the record, Doctor Gupta. There was some background noise. There may still be some.

You mentioned that you wanted to study these other abnormalities in the mouth. What was the purpose of studying these other abnormalities in the mouth?

A. The purpose of studying these was to find out the link between tobacco habits, the -- and oral cancer. And we found out that in our extensive cross-sectional studies that these abnormalities, these leukoplakias, were very strongly associated with the habit of chewing tobacco and smoking tobacco that rarely occurred, never occurred among those who did not chew or smoke tobacco.

Q. You have used a term which you said was leukoplakia?

A. That's right.

Q. Could you spell that please, sir?

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A. L-e-u-k-o-p-l-a-k-i-a.

Q. Excuse me one second.

Are you saying that the leukoplakias are what you are calling these abnormalities in the mouth?

A. Yes. Leukoplakia is one -- is the most common precancerous lesion.

Q. You used a term, "precancerous lesion."

A. Yes.

Q. Would you explain to us a little bit what you mean when you say a precancerous lesion?

A. Yes. Precancerous lesion means a lesion which is more like -- now, this has been a subject of a little bit of debate and therefore this has been standardized, the definition of precancerous lesion has been standardized. A meeting of the World Health Organization was specifically called for this purpose a few years back, several years back.

And they defined precancerous lesion as an abnormality in the oral mucosa which is more likely to become malignant than its normal counterpart, then its apparently normal counterpart.

Q. When you say a lesion, are you talking

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about something a layperson would refer to as a sore place in the mouth? Can you give me some idea of what you mean by that?

A. Yes. When I speak of a lesion one means a localized area in the mouth. It can be identified by a clinician or a person especially trained in diagnosing those lesions. The individual himself may not be aware at all of these lesions because they do not cause any pain, they do not cause any symptoms.

Q. Now, when did you commence these studies on these precancerous lesions?

A. In 1966.

Q. And this was done at roughly the time that you had come to the conclusion that the use of oral tobacco causes cancer; is that correct?

A. Yes. That is right.

Q. So you undertook a study of the lesions as they appear prior to the time that they become cancerous; is that what you are telling me?

A. That's right. We wanted to study these lesions which were reported to turn into cancer, oral cancer, much more often.

Q. What was the purpose of conducting these

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kinds of studies?

A. We wanted to -- the basic purpose of conducting any epidemiological investigation, I believe, is ultimately prevention of disease. As oral cancer is the No. 1 major cancer problem in India, the purpose of our study was to find out the better ways and means to prevent oral cancer in India.

Q. And what precisely does the purpose of preventing disease have to do with studying these precancerous lesions?

A. If we can find out at a lesion stage, at the precancerous lesion stage, then, and if we know at what rate do these lesions become malignant, what are the characteristics of these lesions which are sort of conducive for malignant transformation, then we can treat these lesions from becoming malignant. Or if we know how do these lesions occur in the population, then we can have a primary prevention, that is we can prevent these lesions from occurring in the population.

Q. Now, sir, have your studies led you to any conclusion as to what causes these precancerous lesions that you referred to?

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A. Yes. We have re-examined people -- 30,000 people over a period of ten years, same people; and what we found was that these leukoplakias, they occurred only among individuals who had the habit of either chewing or smoking tobacco. Not a single leukoplakia or precancerous lesion was found among those who did not have any habit of chewing or smoking tobacco. Although in our sample we had a large percentage of individuals who did not chew or smoke tobacco.

The second major finding was that all the oral cancers which we observed in our studies, they developed among individuals with a prior diagnosis of an oral precancerous lesion or an oral precancerous condition.

Q. So you are telling me that you only found these precancerous lesions in persons who used oral tobacco or who smoked?

A. That's right.

Q. And you only found cancers in people who had a history of these precancerous lesions?

A. That is right.

Q. And how many people were involved in this study?

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A. 30,000.

Q. Do you have today here at this deposition any photographs that would demonstrate what you mean by these leukoplakias or precancerous lesions?

A. Yes, I have. In the paper that we have referred to there are photographs of oral precancerous condition, leukoplakia, and we have followed them over the years and how do they become oral cancer.

Q. I'm going to hand you -- are you referring to this green volume?

A. That is the one I'm referring to.

Q. The one marked plaintiff's Exhibit 5?

A. Yes.

Q. If the photographs are in there, would you find them for us, please, sir?

A. Yes.

These are the examples of the photographs. These are the leukoplakias.

Q. Excuse me one second. What page are you looking at on that document?

A. I am looking at page 322.

Q. Would you point to the photographs that you are referring to?

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A. Yes. This is one photograph I am referring to, which is a photograph of a leukoplakia. This is an innocuous lesion at the time photograph was taken. This was, of course, among one of the several hundreds of photographs that we took, but on following up these individuals, this one, you can see, turned into cancer. The cancer, oral cancer, is a reason almost exactly in the same spot in the same individual.

Q. I'm going to ask you to come around -- let me check with the person who is doing the film.

MR. BRALY: Can you get a closeup of that magazine from where you are?

Q. Why don't you put that up on the wood in front of you and come around to the front of the desk. Let me help you.

MR. BRALY: You got the photographs on the camera?

Q. Doctor Gupta, show us again -- no. Leave it right where you are. Leave the magazine right where you are. Just stand right there, sir.

A. Okay.

Q. Can you show us again the leukoplakia in the first photograph you are referring to?

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A. Yes. This is the lesion leukoplakia.

Q. Is that photograph number A?

A. That's right. This is photograph number A.

Q. Where is it shown that it turns malignant that you refer to?

A. It is in the next photograph of the same individual, same oral mucosa.

MR. JENNINGS: Let me show for the record an objection to the form of the question making the assumption that the leukoplakia had turned malignant. I object to the form.

Q. I will rephrase the question, doctor. What do photographs A and B depict?

A. The photograph A and B depicts a leukoplakia in an individual. Photograph B depict oral cancer in the same individual at the same site, identical site, a few years later.

Q. I call your attention to photograph C on that page.

A. Yes.

Q. Is there anything remarkable about that photograph?

A. There is a -- again, there is a

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leukoplakia -- there is a leukoplakia here.

Q. Where your finger is?

A. Where my finger is is the lesion leukoplakia.

Q. Is there a companion picture to C taken some time later?

A. This was taken a few years later. Down there are all the particulars in the legends of the individuals.

Q. Which is the photograph that was the sequential photograph?

A. This is a sequential photograph.

Q. What does that depict?

A. A cancer, a histologically diagnosed oral carcinoma.

Q. Same person?

A. Same person.

Q. Is the cancer located -- how is the cancer located in relation to the leukoplakia?

A. It's, as anybody can see, it's the identical place, same place.

Q. Why don't you take your seat, doctor.

Doctor, are the examples that you've just shown us in the photograph, are those

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typical of the results of your study of these 30,000 people?

A. Yes, they are. As I said, that all our oral cancer occurred among individuals who had a prior diagnosis of a precancerous lesion, mostly leukoplakia.

Q. You are not telling us that everybody that uses oral tobacco is going to get cancer?

A. Most of the people, a very large percentage of the people, who use oral tobacco do not get oral cancer.

Q. That's the same for people who smoke cigarettes, they don't get lung cancer?

A. That is right.

Q. How does that statement relate to what you said was the relative risk which you termed between 3 and some much higher number for people who use oral tobacco?

A. Right. One can explain it -- put it in many ways. One way of putting it is that if 25 persons out of 100,000 get oral cancer every year among tobacco users, it automatically means that 99,975 persons of the tobacco users do not get oral cancer. Over the lifetime, almost 99.9 percent of

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the persons may not get oral cancer. But when we look at the persons who do not use tobacco and among them only one or two per hundred thousand per year get oral cancer, and among those who are using oral tobacco about 25 or 26 per hundred thousand per year get oral cancer, we can see that the risk of getting oral cancer is 25 -- 10 to 20 times higher among those who use tobacco.

Q. Doctor, we've talked about oral cancer. Can you identify the location of various parts of the anatomy of the mouth where these oral cancers occur?

A. Oral cancer can occur in any part of the mouth. Mouth has generally the inside of the cheek, which is referred to in the literature as buccal mucosa. B-u-c-c-a-l, buccal mucosa.

Then inside of the lips, that is known as labia mucosa.

Then there is tongue. Tongue of course has two surfaces and sides.

Then there is the roof of the mouth.

There is gingiva, which is commonly known as gums.

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Q. All right. Now, from your review of the literature and your studies, have any of these oral cancers that you've come across occurred on the tongue of people that use oral tobacco?

A. Yes. Many of the oral cancers occur on the tongue. In fact, in the published reports, especially from Bombay and south, I think tongue is the second-most-common site of oral cancer.

Q. Did you say from Bombay and further south?

A. Yes.

Q. You are saying that the tongue is the second-most-common site for oral cancer?

A. Yes.

Q. What is the first-most-common site?

A. The first-most-common site is the buccal mucosa.

Q. Doctor, as one of your studies have you been able to determine that, for persons who use equal amounts of oral tobacco, whether there's any significant difference between the occurrence of oral cancer in men and in women?

A. When we look at the marginal figures, just the incidence of oral cancer among man and among woman, generally it is found that it is higher

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among men than among woman. That is how it is written in most of the places. But once we take the habit of tobacco usage into account and other possible factors, such as age, etcetera, there is really not a great deal of difference between the risk for man and the risk for woman.

In our studies, I must say, that we have in one area women who are chewers and men also who are chewers, and we also have women who are -- in another area women who are smokers and men who are smokers. Again, the results in these areas show that there is no sex difference once these habits are taken into account.

Q. Sir, you have mentioned a couple of times the World Health Organization. Would you tell us what that organization is, please, sir?

A. World Health Organization is an organization of the United Nations. It consists of all the -- all the member states of the United Nations, and I believe their health administrators from the governing council of the World Health Assembly.

Q. You also mentioned that you were associated in some way with a working group or a study

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committee of the International Agency for Research on Cancer?

A. Yes. I was.

Q. Have you done any work on the subject of the use of oral tobacco and cancer for that committee?

A. Yes. In June of 1983 the International Agency for Research on Cancer asked me to write -- to work for them and write a review of the literature and summarize the carcinogenic potential of the oral use of tobacco as practiced in India and other Southeast Asian countries.

MR. BRALY: I ask you to mark this document as plaintiff's deposition Exhibit 6.

("IARC Working Group on the Evaluation of the Carcinogenic Risk of Chemicals to Humans - Betel Quid and Tobacco Chewing, Snuff Dipping, and some Nitroso Compounds" was marked Plaintiff's Exhibit No. 6 for identification.)

Q. Doctor Gupta, are there any publications that are put out from time to time under the sponsorship of the International Agency for the Research on Cancer?

A. There is a large body of publications

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which are put out. In particular there is a series of this carcinogenic -- evaluation of carcinogenic potential of risks to humans of various chemicals and other substances.

Q. How many of those volumes approximately have there been?

A. I think about thirty-six volumes are finalized and published.

Q. Is there any shorthand name that they are referred to by the people in your profession?

A. They are generally called as monographs.

Q. And you say there are approximately thirty-six of these monographs that have been published?

A. In this particular series. There may be another series of monographs.

Q. The series you are referring to is on the evaluation of the carcinogenic risk of chemicals to humans?

A. That is the same series I'm referring to.

Q. Now, sir, you mentioned there were approximately thirty-six volumes. Has a

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thirty-seventh volume been authorized for publication?

A. Yes. That has been authorized for publication.

Q. And have you had anything to do with that volume?

A. Yes. I have done a chapter in that volume. Well, I should say that I initially drafted the chapter in that volume, which dealt with epidemiological data and case reports concerning the use of tobacco and oral cancer.

Q. Let me hand you what the court reporter has marked as plaintiff's deposition Exhibit No. 6. Can you identify that document?

A. Yes. This is the same document I was referring to. It's the "Evaluation of Carcinogenic Risk of Chemicals to Humans, Betel Quid and Tobacco Chewing, Snuff Dipping and Some Nitroso Compounds."

MR. BRALY: Let's let the court reporter see that so she can get that information.

Q. Were you reading from the title, sir?

A. I was reading from the title.

Q. Doctor, is there some kind of a working group or committee that's designated to draft these

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documents?

A. Yes. The committee as organized was that there was a large working group of about 30 to 40 scientists invited from all parts of the world, each one of them a kind of expert in his or her own field and was worked and contributed a lot into that field.

These working group was broken down into kind of committees; again, each committee looked into one specific aspect of the evaluation. The committee in which I was looked specifically into the epidemiological aspects of the evaluation.

Q. Now, Doctor, was there any evaluation made with respect to the carcinogenic risk of snuff dipping as part of this evaluation?

A. Yes. The evaluation was made, and I believe it was put as a four-point -- Section 4.4 in the document.

Q. And what was that evaluation that was made?

A. The evaluation what was made, that there is sufficient evidence that oral use of snuffs of the types commonly used in North America and Western Europe is carcinogenic to humans.

Q. Now, sir, are these publications by the

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International Agency for Research on Cancer considered authoritative?

A. They are most authoritative publications on the subject because these are the only publications where so many different experts from different nations and different groups meet and work together to evaluate the entire body of evidence to date.

Q. This finding that you just referred to, when was that adopted by the International Agency for Research on Cancer?

A. This was adopted in the last week of October, 1984. This was adopted unanimously by the entire -- by first -- it was proposed by our committee working on the epidemiology, put forward to the entire working group of the 30 or 40 scientists, and it was adopted unanimously.

Q. Doctor Gupta, a statement that says that "There is sufficient evidence that the oral use of snuff of the types commonly used in North America and Western Europe is carcinogenic to humans," what does that mean?

A. It means that oral snuff causes cancer. That's what it says.

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Q. Now, the document that I -- that you have identified is marked as a draft. Is this the final draft?

A. This is a final draft.

Q. And will that final draft be published as IARC Volume 37?

A. It should be published very soon, before the year as a final, as a monograph.

Q. Doctor, in your mind is there now or has there been since the late 1960's any doubt that it had been scientifically established that the use of oral tobacco causes oral cancer?

MR. JENNINGS: Object to the leading nature of the question.

Q. Let me rephrase the question.

When did you first, and this is repetitive but I'll have to ask you this, when did you first come to the conclusion -- or have you come to the conclusion that the use of oral tobacco causes oral cancer?

A. Yes.

Q. What conclusion have you come to?

A. Based on my readings and the literature I have -- I had come to the conclusion

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that oral use of tobacco causes oral cancer and --

Q. When did you first come to that conclusion?

A. I came to that conclusion personally in about 1968 or '69 when I had worked in this area for a couple of years. I had reviewed all the literature, I had seen my own data. I had come to this conclusion.

Q. Do you have an opinion as to whether at that time that the cause-and-effect relationship between the use of oral tobacco and oral cancer had been scientifically established?

A. Yes. I did not --

Q. What is that opinion, sir?

A. I -- all the scientists I have met since I have been in the field have held the same opinion, identical opinion, that the oral use of tobacco causes oral cancer.

Q. And is that your opinion?

A. That's my opinion as well.

Q. And is that your opinion as a scientist?

A. That is my opinion as a scientist.

Q. Doctor, are you doing any further studies on the precise question of whether oral cancer causes cancer or have you finished doing those

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studies?

A. I believe that the study of cause-and-effect relationship with an oral use of tobacco and oral cancer are almost over but so I -- are finished. There is no more to be gained simply by looking at the association or the causative effect of oral tobacco versus oral cancer. There are a lot of other studies which need to be done, but the cause-and-effect relationship between oral tobacco use and oral cancer I think has been very well established.

Q. Do I understand from that that what you are telling me is it would be a waste of time to perform further studies on that subject?

MR. JENNINGS: Object to the leading nature of that question.

Q. I'll rephrase the question.

Can you identify any purpose for conducting further studies on that precise question? Anything to be gained from it?

A. Yes. The purpose I would see most relevant and most important would be to conduct intervention kind of studies where -- and to demonstrate that among those who stop using tobacco,

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whether the risk of oral cancer goes down and how it goes down and in what time frame it goes down.

Q. In the -- you brought up intervention studies or work in intervention. In the ordinary course of studying an area as a epidemiologist, would you conduct those intervention studies before or after you had made a determination of cause and effect?

A. Generally intervention studies are conducted only after an investigator is reasonably sure that there is a cause-and-effect relationship.

Q. Have you and the people you work with at the Tata Institute of Fundamental Research conducted any intervention studies?

A. Yes. We have been involved in an intervention study. We have been conducting an intervention study on the use of tobacco and oral cancer and oral precancerous lesions since 1977.

Q. And what did you do in order to conduct such an intervention study?

A. Well, we adopted the same methodology and we selected 36,000 individuals in three different areas of India. We went house to house, questioned them, examined them; and then we wanted

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to educate them -- we found out that they have no awareness about the relationship between any kind of use of tobacco and any health effect, including oral cancer. So we wanted to educate them about the possible health effects of the use of tobacco. So we educated -- tried to educate them.

Q. What did you do to try and educate them?

A. Just -- that was a -- that took an effort.

We considered various possible media, and the -- as many of the villagers, in some areas most of them, are not literate, they cannot read and write. The best form of education we thought would be audio/visual. And the film is a very popular medium in India, so we thought that the best way we could do it is by making a documentary film and showing the relationship between oral cancer and tobacco habits.

Q. Did you make such a documentary film?

A. We did make a documentary film.

MR. BRALY: Mark this as plaintiff's deposition Exhibit 7.

(Video tape was marked Plaintiff's Exhibit No. 7 for identification.)

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Q. Doctor Gupta, this film you referred to, what year was it made?

A. It was made in 1977.

Q. Other than the education of villagers were there any other purposes to this film?

A. Yes. That was one of the purposes, our sort of the primary purpose. But then -- a film was being made, it was being made by our group, which is basically a group of scientists working in the field. So the film had to be accurate, as accurate as a scientific document, not a feature film or a fictional film. And the film could also be used not only for villagers, but for our persons and for health professionals.

Q. Does -- are there any aspects of your work or the methodology of your work that are depicted in the film?

A. When we wanted to -- when we thought of making the film and we wanted to tell the villagers about the relationship between tobacco habits and oral cancer, again we wanted to tell them as scientists. So we decided to do it by showing the scientific results and the methodology on which the scientific results are based. So the

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methodology which we adopted for our work was a part of the film.

Q. The film as it was originally made, was it on 60-millimeter movie or 35-millimeter movie film?

A. It was originally made as a 35-millimeter -- on a 35-millimeter movie camera. It was reduced to 16 mm and then to Super Eight mm format also for field work.

Q. Have you caused a copy of that film to be made on video tape?

A. I have.

Q. Let me hand you what the court reporter has marked as plaintiff's deposition Exhibit No. 7. Can you identify that video tape, sir?

A. Yes. I can identify this video tape. I have my signature on it.

Q. Is that an exact copy of the original film?

A. It is an exact copy.

Q. Doctor, before I come back to the film, have you had occasion to review in any way the work of a dentist by the name of Doctor Smith who was -- that was done in the 1970's in the United States?

A. Yes. I have seen and reviewed his work.

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Q. Having reviewed his work and from the data that he has presented, do you have an opinion as to what conclusions can be drawn, if any, from that data?

A. I'm of the opinion that no conclusion can be drawn from the data which are presented in those two studies. There are two papers by Smith.

In reviewing that, those papers, I was kind of interested that there -- I think the first paper has six or seven pages. Out of the entire paper there is only about half a page which really used anything about the study itself, the result and the methodology. The rest of the paper is strictly off the literature, which is fine but doesn't pertain to the evaluation of this study.

Even in this half a page, again, there are two studies which are reported, one is called a follow-up study, although there is no mention at all of the methodology of the follow-up. So in any follow-up study, until some -- there is some explanation of the methodology of the follow-up, it's hardly possible to evaluate a follow-up study.

So that's one part of the paper, follow-up study. Another part is another study.

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Although he has expressed a conclusion and opinion in the paper that the data show that the oral use of snuff is not related to oral cancer, if you look at those two separate studies the evidence is contradictory. In one study there is no case of oral cancer. In another study out of 500 snuff users there are two case of oral cancer. That gives a prevalence rate of I think 400 per hundred thousand, which would be similar to a prevalence rate found in a very, very high-risk group of people, showing that oral snuff use is related to oral cancer.

Q. Doctor, are you familiar with the work done by Doctor Deborah Winn on the subject of the use of snuff and oral cancer?

A. Yes. I'm familiar with the study she has published on oral cancer.

Q. And what's your opinion of that study, sir?

A. That's a classical case-control study or case-reference study conducted very carefully. All the methodological limitations that are there in the study are noted in the paper itself and all the relevant and pertinent data are given in the paper.

Q. Do you recall where that study was

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published?

A. It was published in the "New England Journal of Medicine."

Q. And can you tell us how that journal is recognized among scientists?

A. Generally after the "Lancet" I think "New England Journal of Medicine" is recognized as the most authoritative journal in the field.

Q. In Doctor Winn's studies were there any reports of relative risks for the use of snuff and the oral cancer that's associated with it?

A. Yes. She reported on the relative risk among oral users of snuff in various categories.

Q. And how would you compare the numbers that she reports -- let me ask you this first. Where was her study conducted?

A. Her study was conducted in -- her cases and controls were collected from North Carolina.

Q. Here in the United States?

A. Here in the United States.

Q. How would you compare the numbers for the relative risk that she reported as among her various groups and subgroups with the numbers that you have

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observed in your work in India?

A. They fall into very similar ranges because she also reports about -- starting from a lower -- some groups starting from two or three or four relative risks and for special groups, high-risk groups, ranging up to 40 or so. We observed the the same kind of results in Indian studies.

Q. Now, Doctor Gupta, besides the use of oral tobacco is the smoking of tobacco related to oral cancer in any way?

A. Yes. It is related to -- oral cancer is also related to smoking of tobacco.

Q. Are there any other risk factors which you consider to be significant besides the tobacco-associated risk factors?

A. As I said, in our studies in India we have not found any other factors to be of any significance, although in the literature there are several other factors which are mentioned, such as diet and nutrition, vitamin deficiency, oral hygiene, and wearing of dentures, alcohol, use of alcohol is another habit. There might be one or -- might I mention genetic predisposition as well.

Q. In comparing all of these other matters to

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the tobacco habits, do you have an opinion as to whether they constitute any significant portion of the problem in the causation of oral cancer?

A. I -- as I said, from the literature review of all the studies which are reported, I do not think that these other factors constitute any significant proportion of oral cancer. I can put it in other words. Any significant portion of these oral cancers can be attributed to these other factors.

Q. I'm not sure I understand what you are saying.

If you have to group the tobacco-related causes in one hand and all of the other causes that have been mentioned as possible risk factors in the literature, how would you compare the two?

A. We have done this exercise in a meeting of the World Health Organization where we tried to find out how we could -- how much of oral cancer can be really attributed to the habit of tobacco chewing and smoking. And we came to the figure of 91 percent, 91 percent of all oral cancers, especially in the developing countries of India,

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could be attributed to the use of tobacco in the form of chewing or smoking.

Q. Doctor, this film that you have identified for us and that has been marked as plaintiff's deposition Exhibit No. 7, is it considered to be an authoritative presentation of the risks of oral tobacco and oral cancer?

MR. JENNINGS: Object to the form of the question as leading.

Q. I'll recharacterize the question. Let me rephrase that.

Doctor Gupta, is this film considered by you to be authoritative on the subjects to which it speaks?

MR. JENNINGS: Object as leading.

Q. You may answer that question, sir.

A. Well, let me -- rather than answering that question in one sentence, let me tell you how the film was made.

We invited the film maker to make a film and we gave the general topic that this is what we want to do, we want to depict the relationship between tobacco habits and oral cancer. And what we did was we gave him all our risks papers --

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we gave him our research papers. We have a huge body of research papers which have come out of the project. We gave him all of the research papers and photographs of that. They took and read the papers. Then they came up with the script. We examined, we means I and my colleagues and my research team, examined the script very carefully, discussed with them and modified it several times and we let them go ahead.

When they were filming it our unit members were constantly present. They did not film any sequence independently. It was filmed only in the area that we were working. And after the shooting was over, even at the time of editing the film and finally compiling it, one of the unit members was always present. Similarly while writing commentary, we took great care that no statement should go in the film which is not approved by us. So in this respect I and our unit consider that film to be quite authoritative.

MR. BRALY: At the present time I would offer counsel the opportunity to view the film before I engage in any further questioning. I think there's a video tape machine and a television set

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present here.

MR. JENNINGS: Okay.

MR. BRALY: Let's go off the record if counsel agree.

MR. JENNINGS: Yes.

(Brief recess.)

MR. BRALY: Alston, can the record reflect that you've had an opportunity to view the film?

MR. JENNINGS: Just don't let it reflect that I have no objection.

MR. BRALY: I understand that. I am quite sure you will have a number of objections.

MR. JENNINGS: I have seen it.

Q. (BY MR. BRALY) Doctor Gupta, we've been off the record and the defendants have had an opportunity to review the film. Who funded this film?

A. The funding for the film came from a part of the research grant which came from the National Institute of Health, USA.

Q. Has -- who owns this film right now, the original?

A. This film is a public property right

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now. We -- after making it we donated it to the government of India, the film industry of the -- films division of the government of India. So it's basically a public property.

Q. Has this film won any special awards or prizes?

A. Yes. This film has won the Best Educational Film Award in the National Film Festival in 1977 of the government of India. It has also won an Honorary Mention in the film festival in Buenos Aires, a film festival along with the cancer --

Q. Has this film been shown to any groups of professionals interested in this subject?

A. After the film was made it was shown in the Seventh International Conference of Oral Biology, which was held in Copenhagen in 1977.

It has also been shown in the world conference -- Conference on World Smoking and Health at Winnepeg, Canada, some years back.

It has been shown in numerous meetings and conferences.

It has been shown all over India, in all parts of India by the government of India. It has been shown on television in India.

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Q. Sir, you mentioned that this film was made as part of an intervention study. Have you had occasion to observe any results from your intervention studies?

A. Yes. As a part of my research project here at Harvard, I have myself five-year data from our intervention study. We see that our intervention campaign, with the intervention campaign about 10 percent to 20 percent of the individuals in different areas have stopped -- have said that they have stopped using tobacco and another 40 percent or 50 percent say that they have reduced the frequency of their usage.

Q. Doctor Gupta, I just have one further question.

You've described some intervention studies involving 30,000 or so people, or population studies, excuse me. I want to ask you, I am not sure I understand, have you -- has among your population stud -- have you among your population studies ever found an oral cancer in a person who was not a user of tobacco?

A. As I said, we have conducted population basis study involving more than 200,000

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individuals, involving follow-up of ten years to sixteen years now of many of these individuals. We have not yet found a case of oral cancer which did not have either chewing or smoking habit of tobacco.

Q. You are not denying that cases occasionally occur in hospitals where somebody shows up with an oral cancer who denies the use of tobacco?

A. No. These cases have been reported in the literature and so these cases do exist.

Q. But now as among your population studies, when you examined more than 200,000 people, you have yet to find an oral cancer case on any person who was not a user, either smoking or in the oral form of tobacco; is that correct?

A. That is correct.

MR. BRALY: I don't have anything further of this witness.

I would move the admission of all the exhibits.

MR. JENNINGS: We reserve our objection.

MR. BRALY: Let's go off the record.

(Brief recess.)

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AFTERNOON SESSION

CROSS-EXAMINATION

Q. (BY MR. JENNINGS) Do I pronounce your name correctly as Gupta?

A. Yes, sir.

Q. Isn't it true that the overwhelming majority of people who use tobacco do not get oral cancer?

A. That is true. In my testimony I said that the incidence rate of 25 per hundred thousand per year of oral cancer would mean that 99,975 persons of those who are using tobacco will not get oral cancer in that year.

Q. So the overwhelming majority of people who use tobacco do not get oral cancer?

A. That is right.

Q. Why not?

A. The overwhelming majority of people who live do not die every year. The death rate is 10 per thousand and 9,900 -- I'm sorry. If death rate is 10 per thousand, that means 99 persons are alive at the end of next year. And if most of the persons who do not use tobacco do not get oral cancer, they may get any other disease or they may

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get it after many years.

Q. Can you tell me or do you know why the overwhelming majority of people who use tobacco do not get oral cancer?

A. No, sir. I do not know nor do anybody knows why the overwhelming majority of people who use oral tobacco do not get oral cancer. I also do not know why overwhelming majority of people who are exposed to malaria, exposed to mosquitos, do not get malaria. I also do not know why the overwhelming people in India exposed to tuberculosis virus do not get tuberculosis. There are so many things which I do not know.

Q. You know, of course, that we're not talking about malaria and we're not talking about tuberculosis. We are talking about oral cancer.

A. Yes, exactly.

Q. The simple answer to my question is you don't know why they don't get it, do you?

A. No, sir.

Q. Isn't it true that people who do not use tobacco do get oral cancer?

A. There are isolated case reports in the literature that people who do not use tobacco get

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oral cancer.

Q. So the answer is yes, it is true that there are people who do not use tobacco who get oral cancer; is that right?

A. That is right.

Q. What causes their oral cancer?

A. We do not know.

Q. So there is something out there that's causing oral cancer that's not tobacco, isn't there?

A. I have to explain this a little bit. Okay?

Cancer is a disease which is a process of living cells. Cancer can occur in any part of the body in any living being, maybe animal or plant or human being. What causes any cell or any group of cells to become cancerous, we yet do not know exactly.

We do know that certain substances, certain exposures, cause these cells to become cancerous much more often.

Q. We know that the association appears more often; whether it is a cause-and-effect relationship we do not know, do we?

A. We know that it is a cause-and-effect

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relationship as we define it in epidemiology.

Q. That is what?

A. As we understand and define the cause-and-effect relationship in epidemiology, we do know many cause-and-effect relationships between cancer and specific substances.

Q. And epidemiology assumes that there is something outside of the individual that causes the cancer; is that correct?

A. Epidemiology starts on premise that there is the -- the basic hypothesis is that there is nothing outside which increases the risk of cancer. On the basis of that hypothesis data are collected. That hypothesis might be rejected by the data. If the hypothesis is rejected by the data then yes we come to a conclusion that yes, there is something outside which is causing cancer.

Q. Do you come to that conclusion or do you assume that?

A. We come to the conclusion. We do not assume that. We only assume in the beginning that there is no relationship. Let us design a study in such a way that a priori we assume that there is no relationship between that substance and cancer.

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Q. That assumption could very well be correct, is that right?

A. That's right.

Q. That there's nothing outside that produces it, that it comes from within the human body?

A. A study is designed to test a specific hypothesis and a specific hypothesis, that is true, we can either accept it or not accept it.

Q. Aren't tumors the result of the ability of the body to reproduce cells? Basically.

A. Basically. Basically all living beings need to reproduce cells.

Q. It is when that reproduction of cells gets out of volume control that you have a tumor; is that not right?

A. That's one of the aspects of a tumor.

Q. Very good.

Incidentally, I understand that you are entitled to the title of "doctor" because you have a Doctor of Science degree; is that correct?

A. That is correct.

Q. You do not have a medical doctor or an M.D. degree, do you?

A. That is correct.

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Q. You are not an oncologist?

A. I'm not a medical doctor, so --

Q. You're not a pathologist; you are not any type of medical doctor?

A. I'm not a medical doctor.

Q. You are not an oral pathologist?

A. I am not an oral pathologist. I am working with oral pathologists and dentists for the past 20 years. But I am myself not an oral pathologist.

Q. You do not diagnosis or treat disease?

A. I do not diagnosis or treat disease, that is correct.

Q. And as I understand it, you have an undergraduate degree from where?

A. I have an undergraduate degree from Holkar Science College, Indore.

Q. Where?

A. Holkar Science College, Indore, Madhya Pradesh, India.

Q. You have a Master's degree from what school again?

A. I have a Master's degree from the University of Bombay in statistics.

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Q. And you got that degree in 1965?

A. That is correct.

Q. And in 1966 you began working as a statistician; is that correct?

A. That is correct.

Q. And it was in that year that you formed the opinion that tobacco caused cancer; is that correct?

A. I said somewhere in 1968.

Q. '68.

A. Yes. I formed this opinion on the basis of my own readings and conversing and discussing these various aspects with my senior colleagues who were working with me.

Q. And who were some of those senior colleagues?

A. I would mention one name, Professor Jens J. Pindborg.

Q. Okay.

A. He is my senior colleague. He's a professor of oral pathology in Royal Denmark, Copenhagen, Denmark.

Q. Who else?

A. Doctor Fali S. Mehta. He's our group head.

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Q. That's M-e-h-t-a?

A. That's right.

Q. Who else?

A. I have had occasion to speak with scientists from other parts of the world.

Q. How about Doctor J.E. Hamner?

A. Yes. Doctor J.E. Hamner was -- is also associated with the project.

Q. You discussed with him and he was convinced that tobacco caused oral cancer?

A. No, sir. I did not meet Doctor Hamner for quite some time after I joined the project.

Q. But Doctor Mehta and Doctor Pindborg were two of the people, senior people with whom you associated who were convinced that tobacco caused oral cancer?

A. That is right.

Q. And that was from your early days of '66; is that correct?

A. Yes, that is correct.

Q. Have you any knowledge whatsoever about Sean Marsee?

A. I have some knowledge as given in a copy of whatever is the legal name, the document

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which was --

Q. That's the Complaint that was filed in court?

A. That's right.

Q. Do you have any other knowledge whatsoever?

A. I have -- that case was referred to in a TV program that I have seen, and I had attended the public hearings in the State of Massachusetts on smokeless-tobacco warning label where this case was referred to. So that's the knowledge I have.

Q. That's the extent of your knowledge?

A. That's right.

Q. You've never seen any medical reports about Sean Marsee?

A. No. Nothing else. No other medical reports.

Q. You know nothing about any disease he might have had other than the things you have described as your sources of information?

A. That is right.

Q. I assume then that you are not telling us that Sean Marsee's cancer was caused by tobacco?

A. I am implying that in the absence in the body of the knowledge that we have right now

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with us, it is highly likely, highly probable that cancer in the tobacco user at the site where the tobacco quid is placed and the site coming into contact with it, is due to the tobacco in the quid.

Q. What was the site where the tobacco was placed?

A. Tobacco is generally placed in the buccal pouch, buccal cavity.

Q. Is that where he placed his?

A. I assume that's where he placed his.

Q. Well, you don't know where he placed it then, do you?

A. I've been -- no. I do not know exactly where he placed it.

Q. So you don't know whether he had the cancer at the site where he placed the tobacco or not, do you?

A. That is -- I do not know exactly where the -- exactly where he placed the quid and where exactly the cancer occurred. As I say, I have not seen any medical records. But when a cancer occurs in a buccal pouch or in a location near the buccal pouch, and these are the most common cancers occurring in India, and it is demonstrated that

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these cancers are generally at the location where this quids are placed.

Q. Now, that's a common fallacy, isn't it?

A. What is a common fallacy, please?

Q. That you know that tobacco, not smoking, causes oral cancer because the cancer occurs at the point where the tobacco is placed.

A. That is one of the long list of reasons. That is not the reason. And that simply kind of substantiate, substantiates our conclusion, but it's not the reason.

Q. You know as a matter of fact that there is no real correlation between where the tobacco is placed and where the cancer occurs, don't you?

A. We know very well that there is a correlation between where tobacco is placed and where the cancer occurs.

Q. What about the people who smoke, where do they place the tobacco?

A. We are talking about the oral use of tobacco, chewing tobacco, substances containing tobacco. People who smoke, they also have a slight predilection, but I think that's --

Q. Slight predilection for what, for where the

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smoke goes?

A. Where the cancer occurs.

Q. What?

A. Where cancer occurs. They have a slight predilection for that.

Q. But it has nothing to do with where a quid is placed, does it?

A. What are we exactly talking about here? I'm not clear.

Q. I'm talking about the common fallacy that the reason now that smokeless tobacco causes cancer is because the cancer occurs at the site where the tobacco is placed.

A. I'm saying that it's use -- the common fallacy itself, I object to. It's not a common fallacy. It's only one of the reasons, one of the long list of reasons why we consider tobacco to be a carcinogenic substance.

Q. Well, then I would assume that it would be very important in any research that you did to find out the site at which the tobacco was placed as it related to the site of the cancer; is that correct?

A. That is one of the criteria. But it is not the important criteria because people do not

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keep tobacco at all the time in one part of the mouth. They can move it around the mouth. And tobacco when it is kept in the mouth can influence any part of the mouth. So it's not one to one. But there is certainly a tendency for cancer to occur more at the site where tobacco is placed.

Q. What you are doing now is explaining to me why it's not important where the tobacco is kept; is that correct?

A. I am not saying that. I am saying that it is important to know where the tobacco is placed. For example, in north -- northern, the State of Bihar, where tobacco is placed in labial mucosa, that's a rather unusual place in the lower part of the labial groove, cancer in the population generally occurs in that part of the mouth.

In south, where the tobacco quid is placed in the buccal pouch, cancer occurs in that part of the mouth.

I'm told that in Sweden, where snuff is placed in the upper part, very unusual but it is placed in the upper part of the labial groove, the cancer generally occurs in the upper part.

Q. So it is important in any study to find out

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where the tobacco is placed and where the leukoplakia or the oral cancer occurs; is that correct?

A. It is one of the many important observations that should be noted in any study.

Q. Were you one of the authors of the report entitled "Oral Cancer and Precancerous Conditions in Indian Rural Populations, 1966-1969"?

A. That is right. I was one of the authors.

Q. It was published in 1971?

A. That is right.

Q. And in that study is there any report anywhere with regard to the location of the quid as related to the location of either leukoplakia or cancer?

A. Yes, sir. I think -- can I have the document, please?

MR. BRALY: Is this what you want?

THE WITNESS: Yes. That is what I want.

A. On page 69 we have a double which shows the location of leukoplakia according to specifics, and this shows that chewing -- among

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chewers leukoplakia generally occurred in buccal mucosa where the quid was placed.

Q. Well, you don't say where the quid was placed, anywhere in this report you don't say where the quid was placed.

A. I think it is said in the review of literature that in the northern part of India the quid is placed in the lower labial groove, and in most of the parts of south India the quid is placed in the buccal groove. I cannot exactly recall where it has been said or where --

Q. I can tell you where you say that if that's what you want to know. You say it on page 18.

A. It is -- I must mention that it is very common knowledge because this is -- this is known since -- this study is done in '40s. These are habits that don't change. These are -- these vary from region to region, not so much from individual to individual.

Q. Well, why wasn't it important to find out from each individual where that individual placed the quid?

A. We have that information in our records.

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Q. But you didn't think it was important to put it in the report?

A. No. Because it is the same for 10,287 individuals.

Q. And the fact that you had over -- well, you had more than 50 percent of the people who had leukoplakia who didn't even use smokeless tobacco, didn't you?

A. We had our leukoplakia among those who either chewed or smoked or both. And just to go back, on Page 21 of the document, it's clearly said that khaini -- well, it doesn't say that it is kept in labial groove, but the word "khaini" is generally in the literature, it is known that khaini is placed in the lower labial groove.

Q. That what is?

A. Khaini, k-h-a-i-n-i. That is a local name for a mixture of tobacco and lime.

Q. As far as Sean Marsee is concerned, you do not know where he placed his quid or where his cancer occurred, do you?

A. I suppose that he placed his quid somewhere in the mouth and his cancer occurred somewhere in the mouth.

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Q. Good. So if you placed tobacco in your mouth and have cancer in your mouth, that proves that the tobacco caused the cancer; is that correct?

A. In one individual if tobacco was placed in the mouth and cancer occurred in the mouth, it does not -- may or may not prove that tobacco causes oral cancer, but what I'm referring to is a conclusion from the whole body of the literature.

Q. You are talking about conclusions that have been arrived at after making some sort of research or survey of a part of the population; is that correct?

A. That is right.

Q. Okay.

Now, let me ask you about oral tobacco. That's a phrase I really heard for the first time here. Other than sniffing of snuff is there any way that tobacco is customarily used other than orally?

A. It is smoked.

Q. Well, don't they get the smoke in the mouth?

A. It's much more than that. It's --

Q. Well, I'm trying to find out what you mean by oral tobacco. Do you mean smokeless tobacco?

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A. Yes.

Q. Okay. So when you use the term oral tobacco, you are talking about smokeless tobacco; is that correct?

A. Yes. In general.

Q. What is the incidence of the use of snuff in India?

A. Snuff, as I understand, is a name given to a commercial product in general. It is sold on under different brand names. Therefore -- and I do not think that in India tobacco is sold under the name of snuff.

Q. So snuff is really not known in India, is it, as such?

A. As such, snuff by the name of snuff is not known.

Q. Do you know of any tobacco product in India that is similar to snuff as you understand what snuff is?

A. As I understand, snuff contains tobacco and there are many other ingredients which are trade secrets, which are not told. The basic ingredient is tobacco.

In India there are many chewing

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combinations which have tobacco as their basic ingredient.

Q. But snuff as we know it in the United States is not used in India?

A. No.

Q. Your answer was no?

A. The answer is no.

Q. What do you mean by the term "association" or "associated with" or "in connection with" two phenomena?

A. Well, the two phenomena generally would be dichotomous, have two categories, occurring and non-occurring, and their association would mean either that they occur together more often or that they do not occur -- or when one occurs the other does not occur.

Q. Does "association" or "associated with" mean something more than coexisting?

A. It does.

Q. And it means then coexisting more often; is that --

A. No. I said that it means something more than coexisting. Coexisting only implies that both have been existing and that you have discovered

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that coexistence. But when we use the term "associatio it might be more than coexistence because one may have followed the other. In epidemiology we are not really so much interested in coexistence of phenomena, but whether the disease has followed the risk factor, which is I think more than simple coexistence.

Q. Well, let me ask you this: Would you say that in the case of me that brown eyes are associated with white hair?

A. I do not think that we term to use -- when I said -- every term can have a dictionary meaning, a common meaning and a little bit of a specialized meaning. When I use the terms "association" and I am talking about association, I am using it in a little bit specialized meaning and that means in a somewhat statistical sense. So in somewhat statistical sense, it would be not -- I would not use the term "association" for one single individual of one single person.

Q. But if you have a number of individuals who had brown eyes and gray hair would those be two things you would say were associated?

A. No.

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Q. Why not?

A. Because you have to look at the persons who do not have brown eyes and do not have white hair. And look at those persons and if there is association there, then one can say that they are associated.

Q. Well, suppose you looked at a whole bunch of people and you found that the combination of white hair with brown eyes was much more frequent than the combination of white hair with blue eyes, then what would you say?

A. Now we are distinguishing only between brown and blue eyes, or brown and non-brown eyes?

Q. Brown and non-brown eyes.

A. Okay. White hair, non-white hair, brown eyes, non-brown eyes.

Q. Right.

A. We select a sample, we put them in the two categories and we examine the association. We find that there is significant association, and we say that brown eyes are associated with gray hair, fine.

Q. If you found enough of an association, you could say that, couldn't you?

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A. Yes. Right.

Q. And that's not -- I don't know whether it's true or not, but it's certainly something that could be true, isn't it? I mean, you don't find it impossible to believe that brown-eyed people turn gray more often than non-brown-eyed people?

A. I personally would find it rather difficult to believe. I don't have -- I don't know whether I have brown eyes. I am turning gray very fast.

Q. You do have brown eyes. I can tell you that.

But anyway, if that occurred in sufficient numbers among the population, then you'd have an association, wouldn't you, of brown eyes and white hair, if it was statistically more frequent?

A. Yes. If somebody was interested in this particular problem, I would suppose he would.

Q. And then you would conclude that either brown eyes cause white hair or white hair caused brown eyes; is that correct?

A. That would be jumping it a little -- one stage further. He had only seen that brown eyes are associated with gray hair. He has not found out

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whether the brown eyes came first or gray hair came first or, you know, what was the -- what they relate to one another.

Q. Or that both were caused by something entirely unrelated to each other?

A. That is right.

Q. That's right. And to say that they were -- either caused the other, would be what is known as a leap of faith, wouldn't it?

A. Yes.

Q. Would you accept that?

A. I accept that.

Q. Are you acquainted with Malcolm Maclure?

A. That name sounds a little bit familiar.

MR. JENNINGS: I'm going to ask the reporter to mark this document as defendant's Exhibit 1.

("Popperian Refutation in Epidemiology" was marked Defendant's Exhibit No. 1 for identification.)

Q. While Mr. Braly is looking at that, have you ever heard the name Karl Popper?

A. Karl Popper? No, I do not remember that name.

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Q. You do not know that name.

In the study of epidemiology you did not come across the name of Karl Popper?

A. Let me confess that I am extremely bad in remembering names, so even if I have come across the name ten times I might not remember it.

Q. You do not recognize that name as being the name of an eminent epidemiologist?

A. Karl Popper, no. I do not ---I do not recognize the names of all the -- most of the prominent epidemiologists, I really don't.

Q. Let me hand you what has been marked as defendant's Exhibit 1. I want to read some portions of that.

In the paragraph on the right-hand side of the page 1 or page 343, it is at the top, referring to Popper, the author said, "He argued that certainty is impossible, that theories cannot be proven, and that the only logical approach to scientific knowledge is falsification, (refutation)."

Do you see where I'm reading?

A. Yes.

Q. Do you agree or disagree with that?

A. Yes.

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Q. Which?

A. I agree.

Q. You agree?

A. Yes.

Q. And then he goes on to say, "Unrecognized positive or negative confounding, or bias, is always an alternative explanation for an association or its absence. Epidemiology cannot prove or disprove anything absolutely."

A. I agree.

Q. You agree with that?

A. I agree entirely.

Q. All right, sir.

Incidentally, if you refer to this article you will see down at the bottom of the left-hand column that Malcolm Maclure is with the Department of Epidemiology at Harvard School of Public Health in Boston, Massachusetts?

A. Yes. That's why I said the name is familiar.

Q. So you do now recognize who he is?

A. Yes. As soon as I said it I recognized --

Q. This particular article was published in

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the "American Journal of Epidemiology?

A. That's right.

Q. Is that a respected -- respected publication?

A. It is a very respected publication in the field of epidemiology.

Q. Then if you look at page 344 and the first full paragraph on the left under the subhead which reads, "A crude association can be found to prove any theory but this is unscientific. Good epidemiology proceeds by systematically refuting hypotheses." Do you agree with that?

A. Yes.

Q. Down at the bottom of page 345 on the left, the last sentence, "Furthermore, in study design, deciding which potential correlates of disease to collect data on" --

A. Can you repeat? Excuse me, where you are?

Q. I'm sorry. I'm at the bottom of the left-hand column on page 345, the last sentence which starts about six lines from the bottom.

A. Yes.

Q. "Furthermore, in study design deciding

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which potential correlates of disease to collect data on, and which to analyze, amounts to hypothesizing potential relationships -- imagining the facts before seeing them."

Do you agree with that?

A. I'm not sure in the full context what does he mean. But if I understand it right, yes, I think it is okay.

Q. All right.

Now, let's pause there for a moment.

The study that was performed in India from 1966 to 1969 by you and others, which included Doctor Mehta and Doctor Pindborg and Doctor Hamner, and actually those three were the men who were in charge of that study, weren't they?

A. Doctor Mehta and Doctor Pindborg were mainly in charge of this study. Doctor Hamner was an NIH project officer.

Q. At the time the study was started they had already decided and had started to convince you that tobacco causes oral cancer.

A. I would not put it that way.

Q. I know you wouldn't, but that's the way it

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is, isn't it?

A. No. I had studied the literature myself. They did not want to convince me. When I have some doubt in the literature, I would ask them what does this mean and they would tell, well, this is what it means. And I -- I was getting convinced myself from the literature.

Q. The study was made in India for two reasons: Because of the high use of tobacco and the high incidence of oral cancer.

A. It was basically made for the high incidence of oral cancer, and it is known that that there is a high incidence of tobacco usage as well.

Q. And it was made to set out to see if you could establish that tobacco caused oral cancer, wasn't it?

A. No, sir. As I said, in designing any study, one starts from a hypothesis that there is no relationship between the risk -- between factor and the disease, so we start out with the hypothesis that there is no relationship between tobacco habits and oral cancer.

Q. And if you don't start with that hypothesis then you have what is known as bias, don't you?

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A. You may have a very -- not only bias. Bias can be there in a well-designed study as well. A very well-designed study may have some bias. But if you -- one does not design a study with a proper hypothesis, one may end with an invalid study for the conclusion.

Q. Correct. And the proper hypothesis is that you don't know what causes oral cancer?

A. That is correct.

Q. And if you start out with any other hypothesis, you are liable to come up with a study that is not worth doing; isn't that right?

A. That is right.

Q. Okay.

At the top of the right hand column on page 345, the last sentence in the first full paragraph, it says, "In particular, to attribute causality to an association is to increase the universality of the hypothesis to such a degree that it warrants being called a theory."

Do you agree with that or disagree?

A. Exactly where you are? On page 345?

Q. Right. The last sentence in the first full

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paragraph on the right-hand column.

A. I'm at page 345. And the first column you say?

Q. Column to the right.

A. Column to the right.

Q. First full paragraph at the top?

A. "A good hypothesis is" --

Q. Right. Go down to the last sentence. "In particular..."

A. It says, "In particular to attribute causality to an association is to increase the universality of the hypothesis to such a degree that it warrants being called a theory."

Q. Do you agree with that or disagree?

A. Well, the word theory, first of all, I'm not a philosopher of science, this is a media topic and the discussion of theory, what really a theory is, study of philosophy of science and I'm not a philosopher of science.

Q. All right. Let's go over to page 346. In about the center of the page, the sentence that begins, "Two highly improbable theories," do you see that?

A. Yes.

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Q. It says, "Two highly improbable theories of lung cancer etiology are, "Smoking is a necessary cause" and "smoking is a sufficient cause," corresponding to tables 2 and 3, respectively. Both theories imply relative risks of infinity, the greatest deviation from expectation. The fact that these theories, once stated, are instantly refuted by our knowledge that some lung cancer patients have never smoked and some smokers do not get lung cancer, testifies to their high refutability."

Do you agree with that?

A. Yes, I agree with that.

Q. In the middle of the page on the right-hand column of page 346, the second full paragraph under the subhead, which starts "Deduction is purely logical." Do you see that?

A. Yes.

Q. "What is true for all of A should be true of all of B, if all of B is included in A. On the other hand, induction involves a leap of faith. If A is only a subset of B, the truth of A does not necessarily imply truth for all of B."

Do you follow that?

A. Yes.

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Q. In other words, what is true for a part of the population is not necessarily true for all the population.

A. Okay.

Q. Do you agree with that?

A. Yes.

Q. Oh. Good.

"Consequently, we defy logic if we infer that an idea is true in general because it is true sometimes, but we adhere to logic when we deduce that, because it is false sometimes, an idea cannot be true in general."

Do you agree with that?

A. I think there is a jump over there. I am not sure why -- when he says that we defy logic, he is referring to the sort of -- what is a subjective logic itself or the logic as we use in a normal sense. I do not think that we defy logic if we infer from a particular and take it to a general.

Q. Do you not think --

A. I do not think that we defy logic.

Q. Do you agree with the next sentence which says, "Epidemiologists employ induction when they make the informal inference that an association seen

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in a sample probably exists in the general population."

A. That is correct.

Q. You agree with that?

A. Yes.

Q. You have indicated that nobody that you were conversing with toward the end of the 1960's, the late 1960's had any doubt that smokeless tobacco or that tobacco caused oral cancer; is that correct?

A. To the best of my recollection, people who were working in the field who had knowledge of the subject, among them there was little doubt.

Q. Are you familiar with a report of the Surgeon General of the United States in 1979?

A. I am.

Q. You are.

Let me ask you if you are familiar with a statement contained in that report that "Other than tobacco use, alcohol consumption and possibly poor dentician appear to be risk factors for the development of oral and pharyngeal cancer?

A. Yes, that's what he said.

Q. You agree with that. Do you agree --

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A. I said I'm familiar with the statement.

Q. Oh. Do you agree with it?

A. Agree with the statement?

Q. The statement is that "Other than tobacco use, alcohol consumption and possibly poor dentician appear to be risk factors for the development of oral and pharyngeal cancer."

A. Okay. There are some reports I have seen about alcohol consumption which show that alcohol consumption could be a risk factor in the oral cancer. I have not really come across any good study which shows that dentician status could be a reason for oral cancer.

Q. In order, Doctor Gupta, that you may follow along with me, I'm going to ask that this be marked as defendant's Exhibit 2.

("Smoking and Health, A Report of the Surgeon General," was marked Defendant's Exhibit No. 2 for identification.)

Q. Let me refer you to the page that is shown as 5-41 down at the bottom right on that.

A. Yes.

Q. Do you find the statement that -- it's on the fourth line on that page. "In the latter survey,

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cancer of the oral cavity was associated significantly with both cigarettes and alcohol"?

A. This is the fourth line?

Q. From the top.

A. On page 5-41?

Q. Right.

A. "The relative strength of each exposure of the controlling..."

Q. No. The sentence before that. "In the latter survey, cancer of the oral cavity was associated significantly with both cigarettes and alcohol." That's the sentence before where you were reading.

A. Okay. The pages starts like "...between all alcohol and tobacco in the development of oral cancer are the studies of Rothman and Keller, Feldman, et al., Graham, et al., Browne, et al., and the Third National Cancer Survey. In the latter survey, cancer of the oral cavity was associated significantly with both cigarettes and alcohol," yes.

Q. Do you find that sentence?

A. Yes.

Q. Do you agree or disagree with that?

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A. Yes.

Q. You agree with it?

A. Yes.

Q. Okay.

Then if you will look at page 5-42, the paragraph numbered 2, "The use of pipes, cigars and chewing tobacco is associated with the development of cancer of the oral cavity. The risk of using these forms is of the same general magnitude as that of using cigarettes."

A. Yes.

Q. Do you agree with that statement?

A. I do not.

Q. If you will, turn to page 13-39. In the center of the page you see the subhead "Prevalence of Snuff Use and Tobacco Chewing"?

A. Yes.

Q. In the second paragraph beginning "the combination of the low prevalence," do you see that?

A. Yes.

Q. It reads, "The combination of the low prevalence of snuff use and tobacco chewing and the low incidence of oral cancer in the United States makes it difficult to accumulate the large numbers

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of subjects necessary for an adequate epidemiologic study. Many of those who now use snuff or chew tobacco are either current or former smokers and, therefore, are likely to obscure an independent effect of snuff or chewing tobacco. Finally, such use involves a very small percentage of the population ethnically, geographically and culturally different from the general population, which makes it difficult to compare incidence rates with the general population.

"Because of these problems, many of the studies on tobacco chewing have been done in Asia, where the prevalence of both oral cancer and tobacco chewing is higher. The validity of applying these results to the United States is questionable, however, because of differences in the type of tobacco chewed, nutritional status and social habits."

Do you agree with that?

A. No, I do not.

Q. You do not. That's one you don't agree with.

And let's go to page 13-41, and the first full paragraph at the top of the page, "In summary, there does seem to be an association

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between tobacco chewing and leukoplakia and oral cancer in Asia, but it is not clear that the same risk holds true in the United States due to a difference in the tobacco being chewed and to differences in the nutritional status and other characteristics of the population."

Do you agree with that?

A. I do not agree with that.

Q. Pardon?

A. I do not agree with that.

Q. All right.

Go to the next page, 13-42, the last paragraph: "Tobacco chewing is associated with an increased risk of leukoplakia and oral cancer in Asian populations, but the risk for populations in the United States is not clear. An increased risk of oral leukoplakia associated with snuff use in the United States has not been demonstrated."

Do you agree with that?

A. The statement as a whole I do not agree.

Q. You do not agree with. So the statements made in the report of the Surgeon General in 1979 that in effect agree with some of your theories, you

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agree with, but anything that disagrees with your theories you disagree with; is that correct?

A. I object to the use of the word "theory." There are certain passages here in -- with which I agree. There are certain passages in here with which I disagree. The reason for my disagreement is that I do not think the committee or the Surgeon General really looked at the issue of oral cancer and snuff use in as much depth as they looked at the issues in -- issues about cigarette smoking and lung cancer. That was their primary focus. That has been their primary focus.

Q. Who were those people?

A. The names are generally listed in the --

Q. Do you know who they were?

A. Personally?

Q. No. I mean have you made a study of who they were and what their competence was and what they did?

A. I do not personally know them.

Q. Well, do you have any knowledge of who they were? You have just told us that they didn't do something that they should have done, which was to look at it more closely. Now, do you know that they

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didn't do that or do you just suspect --

A. I suspect that they didn't.

Q. You do not know that they didn't do that, do you?

A. No. Certainly.

Q. You do not know who they are or what their competence are, do you?

A. I do not. Their names are there. I do not know them.

Q. You do not know them. You don't know anything about their background or ability?

A. I am sure they are very highly respected scientists and epidemiologists in the United States.

Q. Do you also think they would be people of integrity?

A. Oh, yes.

Q. And they would be stating the opinions for the Surgeon General that they believed?

A. Yes.

MR. JENNINGS: May I take a short recess.

MR. BRALY: Sure.

(Brief recess.)

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Q. (BY MR. JENNINGS) Doctor Gupta, do you recognize what I've put up there?

A. Yes, I do.

Q. You notice across the top where we have written "state."

A. Yes. There are names of the states.

Q. Those are the names of the four states that were involved in the investigation that you were a part of?

A. That is right.

Q. And involved something in excess of 50,000 people?

A. That is right.

Q. And below each state we have a district?

A. That is right.

Q. Are those the correct districts for each state?

A. They are correct districts.

Q. Now, you will notice below that I have the word "code." And I have E, S --

A. B.

Q. Excuse me. E, B, S, BS, BD?

A. Yes.

Q. The reason I did that is because I have a

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great deal of trouble pronouncing those names, and I thought if we could all agree -- is that pronounced Ernakulam?

A. Ernakulam.

Q. If we could use E for Ernakulam, B for Bhavnagar, and S for Srikakulam, BS for Singhbuhum, and BD for Darbhanga.

A. Okay.

Q. I used the B ahead of those because they are both in the State of Bihar. If I don't have to try to pronounce all these again, we'd get along a lot quicker.

Now, I would like to have you, if you would, write in across the way there the -- some figures for me. You are going to need your copy of this report in front of you to check me up.

A. Yes.

Q. Under the word "code," write the word "number."

A. You mean somewhere here?

Q. Well, yes. Up near the double line.

A. Near the double line?

Q. Yes.

A. Okay.

Q. A little bigger, please.

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Now, if you want to check me on these, if you will go to page 60 of your report.

A. Yes.

Q. It says that the number of individuals examined in E district was 10,287.

A. That is right.

Q. Would you write in that figure.

Then if you'll turn to page 84, the number of people in S district was 10,169. Would you write that in, please.

Excuse me. That's B.

A. That is for S. 10,000 --

Q. That's B. I'm sorry. I'm trying to look at this -- it's correct for S, but let's look at B.

Well, let's write that in for S: 10,169, since we're there.

Q. Then if we go to page 42, we'll find in B district that there were 10,071.

If we go to page 102, -- excuse me. 104, you will find 10,048 for BS.

And page 115 we'll find 10,340 for BD.

Q. Now, those were the number of individuals examined in each of those five districts.

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A. That is right.

Q. Those examinations were made by a team of interrogators, dentists, doctors, people who examined their mouth and people who took statements from them and so forth; is that correct?

A. Just modify it a little bit. They were interviewed by the interrogators but examined by the dentists.

Q. Okay. All right.

But this whole operation was a team that was designed to procure information?

A. That is right.

Q. All right, sir.

And under the word "number" let's write "cases of" -- let's just write "oral CA" for "oral cancer."

A. Oral cancer.

Q. Now, you may well remember these figures. I'll be happy to have you check me if you want to, but in E the number was twelve.

A. Twelve.

Q. Does that sound right?

A. Yes.

Q. Do you want to check that?

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A. That's all right.

Q. And under S -- B is next. B, the number was 3.

And S the number was ten. BS the number was zero. And BD the number was one.

Now, the approximate number of -- the number of people examined in each district is approximately the same.

A. Same.

Q. The number of cases of oral cancer varies rather widely, does it not?

A. Yes, they do.

Q. The oral cancer in BS, none; that certainly doesn't indicate anything, does it? Except you haven't got any oral cancer. It doesn't prove anything with regard to causation of oral cancer, does it?

A. No.

Q. And the one in BD doesn't prove anything, does it?

A. No, it does not.

Q. In other words, one in 10,000 doesn't really -- that's not statistically significant, is it?

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A. Well, it has to be worked out, whether it is significant or not, but it may not be.

Q. May not be.

A. Yes.

Q. You could well get another 90,000 and still just have one and not find anymore, couldn't you?

A. Excuse me? Are you -- I can --

Q. Let me put it this way.

A. Yes.

Q. There are well over a million people in each of those districts, aren't there?

A. Yes.

Q. If you were saying that one in 100,000 was not significant, and it's not, is it? Statistically significant.

A. Statistical significance is for comparison, for comparing two numbers, two percentages.

Q. Okay.

A. Now, here when we talk about one in ten thousand, 340 not being significant, what really we are talking about, what I understood as whether it was significantly more than would be expected.

Q. Right.

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A. Okay? In a population, in a general population. But these are all the sample of general population and these are the numbers we have obtained from the general population. So I'm not sure what exactly we'd be testing here for significance.

Q. Not sure what?

A. What we are -- in what connection we are talking about significance over here. Significance of what?

Q. Well, I guess what I'm asking you is if you found one case in 10,340 people who were examined, you found one case of oral cancer, would that be more than you would have expected to find?

A. We should have really the incidence rate or what is the normal expectation of finding cancer, oral cancer in that population. Given that, whether we can -- we can say whether it is significant or not significant, it depends on the -- but we do not know the expected rates of incidence in each of the areas differently.

Q. Well, let me try to pose a question to you.

A. Yes.

Q. If you were expecting to find one out of

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100,000 and you found one in the first 10,000 that you examined, would that indicate that you were getting a higher rate than you expected?

A. I'm not sure I understand you correctly. You are saying that we expected to find one case in a hundred thousand and we get -- in the first 10,000 we get one case, whether it would be significant or not.

Q. Yes.

A. One can work it out. I'm not sure whether it would be significant or not. One can -- one -- I'm saying, if you can tell me exactly what, you know, you really want me to comment on, I can be a little bit more --

Q. I'm going to do that, but my whole point is if you know there's one out there or there should be one out there, in the normal expectation, the fact that you find that one from the first 10,000 people is not of any significance, is it?

A. When we went out here, we did not expect to find any case of oral cancer in general. You examine population, you -- one generally does not expect to find cases of oral cancer because if oral cancer has occurred, it progresses very fast,

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people go to hospital and whatever is the prognosis. At the point in time in examination one does not expect to find a lot of so-called -- prevalent cases of oral cancer. So I'm not sure in what terms you are talking about in terms of significance.

Q. Okay. Let's pass that.

Does the variation from one district to another strike you as being of any significance?

A. There is a variation, yes.

Q. Does that strike you as being significant?

A. Yes. There is a significant variation.

Q. It looks like if you live in E, you got a much, much greater chance or risk of oral cancer than if you live in BS; is that correct?

A. Looking at these figures it would look like that.

Q. As a matter of fact, during your direct examination you have indicated throughout that there are geographical distinctions, haven't you?

A. Absolutely.

Q. Absolutely?

A. Yes. There are many geographic variation, not all over India, all over the world.

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Q. And you don't know what the factors are that cause those geographical variations, do you?

A. That's one of the objectives of epidemiology, to find out what the reasons which cause these significant variations.

Q. Did you find out in this particular research what it was that caused the variations between E and S on the one hand and B and BS and BD on the other?

A. No. I do not think we really looked at the problem of why oral cancer or leukoplakia was less in BS and BD compared to E and B -- and BS. That we did not look much further.

Q. Well, did that excite your curiosity?

A. It does.

Q. Something you'd like to know?

A. Yes.

Q. What effort has been made, if any, to find out why there's this variation?

A. We tried to compare the various -- all kinds of information that we collected and we haven't been able to find any specific reason.

Q. You have been able to find no reason for this variation?

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A. No.

Q. Well, was the variation just something maybe that was just pure chance?

A. It is always possible that it could be due to chance, but the variation was large.

Q. You made a follow-up investigation in this study also, didn't you?

A. Yes. We did.

Q. You made a year-to-year follow-up?

A. Yes.

Q. For a while.

A. For ten years.

Q. Oh. No. Not in all districts.

A. In three of the districts.

Q. You dropped two of them?

A. Yes, we dropped two of them.

Q. You weren't finding enough oral cancer in those two?

A. Yes. There were -- we dropped them, yes.

Q. You dropped them because they weren't producing enough oral cancer to satisfy what you all were trying to prove; isn't that right?

A. No, I would not put it that way.

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Q. Well, you might not, but am I putting it correctly?

A. When you put it that way, yes.

Q. So you did, however, do a ten-year follow-up on all the districts, didn't you?

A. On the three districts, yes.

Q. But you did a tenth year on all of them, didn't you?

A. Pardon?

Q. You did a ten-year on all of them?

A. Pardon? On three of the five districts. We dropped those two districts at the beginning of the follow-up. We started doing it on all of them, but it's a question of resources, resources are limited, certain things need to be dropped, certain things need to be kept.

Q. Now, wait a minute. Have you got a copy of that report, the follow-up?

A. Yes.

Q. Let's get that because we need to look at that.

Q. Look at what has been introduced in evidence as plaintiff's Exhibit No. 5.

A. Yes.

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Q. And turn to Page 288.

A. Yes.

Q. It's follow-up methodology and response.

A. Yes.

Q. And you say that in all the five districts the first follow-up survey was conducted in 1969, '70, roughly three years after the baseline survey?

A. That's right. The first follow-up was -- all five districts.

Q. Since then eight annual follow-up surveys have been carried out in E, B and C?

A. That's right.

Q. Giving ten-year follow-up results.

A. That's right.

Q. In B district -- excuse me. That's in -- yes. In B district the sixth and seventh follow-up surveys consisted only of reexamining the lesion cases and control.

A. That is right.

Q. Now, B is the one that only had three cases.

A. Yes.

Q. So after five surveys, five annual surveys you kind of dropped it, as well as having dropped the other two; is that right?

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A. For two of the follow-up surveys we restricted the follow-up to a section of the population, section of the sample out of the entire sample of 10,000, yes.

Q. Let's keep reading.

A. Yes.

Q. In S, that's BS and BD, the follow-up surveys were discontinued after two or three follow-ups because the incidence of oral lesions was very low in those districts.

A. Yes.

Q. You didn't want to follow it --

A. Yes.

Q. And then you say, "However, a follow-up of lesion cases and controls was done in the two areas at the end of ten years."

A. Yes.

Q. So you did make a ten-year follow-up in those two?

A. Only of lesion cases.

Q. Only of lesion cases. By lesions would that include leukoplakias?

A. Yes.

Q. All precancers?

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A. It would include all the precancerous lesions.

Q. And you already said that you always have precancerous lesions before you have a cancer?

A. I said that in our studies, yes, we had precancerous lesions before cancer.

Q. Now, from your follow-up did you find that the disparity among the districts still existed?

A. Yes. In Bhavnagar district we had only one case of oral cancer.

Q. Let's write "follow-up."

You remember that in B you only found one?

A. Yes.

Q. Do you remember what you found in BS?

A. BS we did not follow up.

Q. But you did at the end of ten years.

A. That was only in the lesion cases.

Q. What?

A. That is not included in this report.

Q. It is not?

A. That is not included in this report.

Q. Let's see.

You found, according to Page 298 --

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A. Yes.

Q. -- that -- let me read it to you. Under Chapter 4, Oral Cancer, bottom of the page, where the paragraph starts, "The three districts" -- do you see where I am?

A. Yes. Yes.

Q. " -- with a low oral cancer prevalence in the baseline survey were B, BD and BS."

A. Yes. Yes. Right.

Q. Or BS and BD. "In BS and BD districts in Bihar state, all the lesion cases and matched controls were followed several times, the last time after a ten-year interval. No oral cancer case was detected from the study population during the follow-up period."

A. That's right.

Q. So can you put a zero under BS and BD.

A. No, I cannot.

Q. You won't.

A. The reason is I would put a sort of subset of these 10,048, that is the number which we really followed up there, and among them we got a zero. So this is not zero from 10,048, but zero from a smaller --

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Q. I follow you. If you don't mind putting the zeroes in there and then put an asterisk by them.

A. Yes.

Q. Now, those zeroes represent a follow-up of people who had some kind of a lesion?

A. That's right.

Q. If they didn't have a lesion during the first three years --

A. Right. They were not followed up.

Q. Then you didn't follow them any longer?

A. Yes.

Q. But you did follow everybody that had a lesion?

A. In those, yes.

Q. At the end of ten years, and none of those precancerous lesions, as you call them, became cancer?

A. That is right.

Q. All right, now. Let's look then at the next paragraph after what -- wait a minute. Excuse me.

In the -- I didn't read this. In B district, one oral cancer was detected during the ten-year study period.

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A. Yes.

Q. Oral cancer developed in a 59-year-old male, bidi smoker, with a prior diagnosis of leukoplakia.

A. Yes. That's right.

Q. So this was a smoker?

A. Yes. That's a smoker.

Q. Okay. Good.

Now, in E you found thirteen and in S you found eleven.

A. Yes.

Q. So you are more or less confirming the conclusion that if you live in B, BS or BD, you probably are not going to have cancer, or at least not near as much a risk if you lived at E and S.

A. That's the way sometimes my group held.

Q. Hold it a second.

A. I said that's the way sometimes our group people advised others, that if you don't want oral cancer, go live up in north, Kashmir or even Afganistan. There is no oral cancer.

Q. Sorry. I had trouble because of the interference. Tell me that again.

A. I said that sometimes that's how we humorously tell others: If you do not want to get

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oral cancer, do not live in Kerala; go north. But that's a humorous way of telling people that.

Q. Well, it may be humerous but it also seems to have some validity if your methods have any validity.

A. No. I think the differences, what you are saying that in living in these areas, I think it does not matter where an individual lives, but these are the differences in the populations. We have not shown that an individual living in Ernakulam would have a higher incidence or higher chances of getting oral cancer because he live in Ernakulam or if the same individual was living in Darbhanga or Singhbhum he would have low incidence of oral cancer because he lived there. That is not what these statistics show.

Q. Well, I guess I can't draw the conclusion that living in E or S is associated with oral cancer or that oral cancer is associated with living in E or S.

A. I do not draw these conclusions.

Q. No. You draw the conclusion it's associated with tobacco. But these statistics indicate that it's associated with living there.

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Don't they?

A. I'm not -- well, it is -- statistics can show a lot of things to a lot of people, sure.

Q. What do you know about the nutrition in those different places?

A. We found out that nutrition status was -- as far as our target population was concerned, the nutrition was generally uniform within the target population.

Q. You didn't discuss that in your report.

A. No. We did not. We had to -- we did not.

Q. What did you find out about use of alcohol?

A. That's -- we had a question on alcohol and some -- in some of the areas there was prohibition, so the information on alcohol in some of the areas may not be very reliable. In some areas there was information about alcohol, it was of no consequence. So we did not think it is necessary to include it.

Q. Whatever information you had about alcohol, you didn't put it in your report?

A. No, we did not put it in. No.

Q. Now, you did make some very detailed

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reports on the habits with regard to the use of tobacco.

A. Yes.

Q. Did you not?

A. Yes.

Q. And you think your memory would be good enough to check me up if I give you some figures or do you want me to go to the report?

A. Okay.

Q. You want to try it?

A. Yes.

Q. Okay.

In E, chewing was 19.7 percent. Let's say -- okay. Right.

19.7 percent, I think. Let's see if I can find that right quick.

A. Which particular page or table you are referring to, because I think there is --

Q. I'm talking about the table on page 62.

A. Table on page 62. Okay. That's only among females, 19.7. That is 19.7 --

Q. I understand.

A. -- is out of 100 percent sample. So out of 10,287 are chewing among -- 19.7 among

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females.

Q. Right. And 6.5 among males.

A. Yes. That's right. So that's about 24, 25.2 percent in the sample.

Q. And smoking --

A. 26.2. I'm sorry.

Q. Male is 6.5. That would be 26.2, okay? Total.

A. Yes. 21.7 and --

Q. And the smoking was 21.7 of males and four-tenths of one percent female.

A. Right.

Q. So generally the men smoked and the women chewed.

A. It was more prevalent among females, although a large percentage of males also chewed.

Q. And where were the cancers found?

A. Nine among males and three among females.

Q. Why don't you put it to the left of the chewing -- no. Wait a minute. -- to the left of the female 19.7 just put a three in parenthesis. That's the female cancer.

A. Okay.

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Q. Okay. So we now know that three out of the twelve were female, so the other nine were bound to have been males. Okay?

Now, let's look at the situation with regard to S.

A. Yes.

Q. Look at table number 35 -- table 38 on Page 85. We show that the total of the chewing habits is 3.3.

A. 3.3.

Q. And that the reverse smoking was 32.2. That's a total of male and female. Excuse me. It's 46.2.

If the -- at first -- we need a chewing. Okay. Put "chewing" under the "reverse smoking."

A. Chewing is already here.

Q. Okay. You've got it in there. Thank you. I'm sorry. I just wasn't paying attention. I was looking.

So we see that reverse smoking is the overwhelming custom there as compared to chewing.

A. That is right.

Q. And there there were ten oral cancers to

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begin with and eleven on the follow-up.

A. Yes.

Q. Now, from those statistics can you reach any conclusions as to whether it is chewing or using smoking tobacco that seems to be associated with oral cancer?

A. No. In Srikakulam district it's quite clear that it's habit of reverse smoking.

Q. That was quite evident, reverse smoking?

A. Yes, reversal smoking.

Q. And that is reverse smoking?

A. That's reversal smoking.

Q. That's when they put the lighted end in their mouth?

A. That's right.

Q. As hard to believe as I find that. I think in a recess you were telling us what they did with the ashes.

A. Yes. Either they spit it out generally or maybe can be swallowed.

Q. And they don't ever have sparks drop on their tongue or anything of that --

A. I do not know.

Q. Okay. Do you think that the heat has

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anything to do with it?

A. That is a hypothesis that people have, that it's a combination of heat as well as smoke.

Q. In other words, the fact that here where you put the lighted end in your mouth the heat factor might be involved in the incidence of cancer; is that correct?

A. Yes.

Q. And I think that in your report you also made an observation with regard to the clay pipe smoking. What's that, a hookli?

A. That's right. Hookli.

Q. And the observation was made that perhaps the heat from the clay pipe was involved?

A. Involved in the leukoplakia.

Q. Pardon?

A. Yes. It was --

Q. In the leukoplakia?

A. In the leukoplakia, yes.

Q. So apparently heat could be a factor in whether or not you get oral cancer, it could be one of the factors?

A. Local heat, yes, combined with carcinogens. Not the heat by itself, but it's the

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combination of heat with smoke of tobacco.

Q. Well, do you know, have you made any studies of people who apply heat in the fashion that you do when you are smoking in any way other than smoking, in their mouth?

A. I'm saying that it is a combination. We do not know whether it is only heat. Among these individuals what is acting as a combination of heat and smoke.

Q. Do you have any studies that would show you that if they were having heat applied in a similar manner but without tobacco that they wouldn't have the same problem?

A. Yes, there is evidence.

Q. Pardon?

A. There is some evidence to that.

Q. There's some what?

A. There is some evidence to that.

Q. Some evidence?

A. Yes.

Q. What's the source of that evidence?

A. That is known as cangri cancer. See, in people in northern part of India, that's Kashmir, where it is extremely coldest part of the mountain

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range, and of course there's a lot of poverty, so when they move around in very cold weather what they do is keep a hot brick in an earthenware pot with coal, lighted coal inside. They keep it under their garments and move around like that. Among these individuals a higher incidence of skin cancer has been noticed and this has been described in the literature as cangri cancer.

Q. So that is a type of cancer that is attributable to just heat; is that correct?

A. They're also, and I speak with people who are -- work in this area, they say it's really the combination of the heat and the smoke from the charcoal which is probably reacting, not just the heat.

Q. So smoke in its -- doesn't have to come from tobacco in order to cause cancer, is that what you are telling me?

A. Cancer on the skin over there.

Q. Well, inside the mouth's got skin, doesn't it?

A. That's epithelium, yes.

Q. Now, I'd like to discuss with you for a moment what you mean by "precancerous."

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A. Yes. Sure.

Q. Do you mean by that that a lesion that you describe as precancerous will inevitably become a cancer?

A. No. It does not mean that.

Q. Actually what is the incidence of let's say leukoplakias becoming, as you call it, cancer?

A. The generally agreed upon figure is about 3 to 6 percent of leukoplakia will eventually turn into oral cancer.

Q. You say "turn into" and use the word "become."

A. Become, okay.

Q. What is the mechanism?

MR. BRALY: Excuse me. I object. If you are asking for a biological mechanism, we already established that he's not a pathologist or a oncologist.

MR. JENNINGS: Well, I think that would go to the weight of his opinion, but I would like to know what his opinion is based upon whatever limited information he might have.

MR. BRALY: I object for the further reason that the question has been asked and

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answered because he said that no one knows the mechanism.

Q. Is that your answer, that you don't know what the mechanism is?

A. The mechanism of exact precisely what?

Q. The mechanism of what is happening when you say that what was a leukoplakia turns into or becomes a cancer.

A. You mean the biological mechanism? No, I do not know --

Q. Whatever mechanism you know of.

A. I do not know anything about the biological mechanism.

Q. You do not know how it happens?

A. No, I do not.

Q. Do you know that it happens?

A. I do know that it happens, yes.

Q. Now, isn't it true that what you really know and all you know is that at one time at a certain site or location you had a leukoplakia and at a later time at the same site or location you've got a cancer; that's all you really know, isn't it?

A. That is exactly what we know, yes.

Q. And whether the cancer developed out of or

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because of the leukoplakia or whether it developed independent of the leukoplakia, you don't know except it's in the same place?

A. Yes. But we also know that the mucosa, which is normal, does not develop cancer as often as leukoplakia develops cancer.

Q. I didn't hear.

A. The mucosa which is normal, which is non-leukoplakia, does not develop cancer as often as mucosa which has leukoplakia develop cancer.

Q. Okay. So again, you are making a -- you're theorizing as to what happens because you really don't know; isn't that right?

A. I am trying a conclusion on the basis of an observation.

Q. Now, are there other lesions that you describe as precancerous other than leukoplakia?

A. In our studies we have introduced a term called preleukoplakia, and that's a precursor stage of leukoplakia.

Q. And you call that preleukoplakia?

A. That's correct. Preleukoplakia, because looking at the lesion we felt that it does not qualify for the diagnosis of leukoplakia, but

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there is something there. And it looks like it might go into leukoplakia, so we term it as a preleuokoplakia.

Q. Does it become leukoplakia?

A. In the follow-up studies, yes, it seemed like it become leukoplakia.

Q. With what frequency?

A. It's there or here in our report. We have in Bhavnagar district --

Q. Could you give me a page.

A. 311. On the ten-year follow-up study paper. 7 percent had progressed to leukoplakia. In the district S, 8 percent had progressed to leukoplakia. In the district E 15 percent had progressed to leukoplakia.

Q. What page was that again?

A. This was page 310 and 311. The table 30, 31, 32.

Q. Okay. That's E, B and S districts; is that correct?

A. Yes. That's right.

Q. While we're looking at those, let's keep your book open to those pages for a moment.

A. Yes.

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Q. Let me ask you this. Do you consider that preleukoplakia is caused by tobacco?

A. Yes.

Q. And preleuokoplakia and leukoplakia are caused by tobacco?

A. Yes.

Q. Sometimes you have preleukoplakia before leukoplakia and other times you just have leukoplakia?

A. That's right.

Q. Or at least by the time somebody's examined that's all you find?

A. That's right.

Q. You don't know whether they had a preleuokoplakia before or not?

A. That's right.

Q. And you conclude from your studies that that is cause by tobacco?

A. That is right.

Q. Now, is it caused by chewing tobacco or smoking tobacco?

A. By both.

Q. By both.

A. Or any one of them, or both of them.

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Q. Which causes it more?

A. As I remember it, I think preleuokoplakia is caused more by smoking tobacco than by chewing tobacco.

Q. The preleuokoplakia, is that what you said?

A. More associated with smoking tobacco than with chewing tobacco.

Q. And what about leukoplakia?

A. There's a table on page 68 which shows that the prevalence of leukoplakia among bidi smokers was 2.5 percent and among chewers it was 1.8 percent.

Q. I'm sorry. What page are we on?

A. We are on page 68.

Q. Page 68?

A. That's right. Table 28 in this document, yes.

Q. Okay.

And we showed -- all right. You show that leukoplakia was 1.8 percent for chewing with tobacco.

A. Yes.

Q. And preleuokoplakia was 2.1 percent.

A. That's right.

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Q. And you showed that smoking, that leukoplakia was 4.3 percent and preleuokoplakia was 10.6 percent.

A. Which is this one? This is --

Q. Table 28. I'm adding up the smoking. Bidi, cigarette and others.

A. Right.

Q. I get the preleuokoplakia --

A. Yes.

Q. -- at 10 point -- I can't read whether it's 8 or 3.

A. I'm sorry. I can't see that.

Preleuokoplakia, the prevalence of preleuokoplakia among chewers was 2.1 percent, among bidi smokers it was 5.2 percent. Among other smokers, -- among cigarette smokers it was 0.8 percent, among others it was 4.6 percent.

Q. So that gives you 10.6 percent total for smokers?

A. No, it does not. Sorry to say. Because, you see, one has to develop the denominators as well. These are the percentages in each group.

Q. Oh. I see. That percentage applies to the

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percentage of those who are doing that.

A. Right. Yes.

Q. Okay. I got you.

But at any rate, with regard to bidi smokers and others, the percentage is greater than twice as many among the smokers as the chewers?

A. Yes.

Q. Okay.

And didn't you find that that was generally true, with both leukoplakia and preleuokoplakia?

A. We thought that way, yes, after this study, that leukoplakia was more associated with smoking habit than with chewing habit until we looked at the results of the ten-year follow-up study.

Q. Did you change your mind then?

A. Yes. Look at the table 21, page 306. In Ernakulam district among males, this is on page 306, table 21, the age-adjusted incidence of leukoplakia is 0.7 per thousand per year among smokers and 2.3 per thousand per year among chewers, among male chewers. Among female chewers it's 3.0 per thousand per year.

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Now, I must explain that these, in this study what we have are what we call in epidemiology prevalence rate. And what I have here are incidence rates. Now, they do have a connection between them, but it involves the duration of the disease or habit, which we did not know at that time.

Now, incidence rates reflect more accurately the risk of the disease or in this case leukoplakia.

Q. So what you just told me is that in E district you have given me the incidence, age-adjusted incidence rate of leukoplakia?

A. That's right.

Q. Will you look at table 22?

A. Yes.

Q. Now we're going to talk about the B district?

A. That's right.

Q. What do you find there?

A. There there is very little chewing habit. The incidence among chewers, 0.7 per thousand and among bidi smokers is 2.9 per thousand. Among clay pipe smokers it is 6.7 per thousand. Among other smokers it was 4.4 per thousand.

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Q. So there the smoking habit in every instance is far more than the chewing habit?

A. Than the chewing habit. That is right.

Q. And of course in that particular district the bidi smoking and the hookli smoking are the two biggest?

A. Yes. Two biggest habits.

Q. That's where you get the hot pipe, from the hookli?

A. Yes.

Q. Okay.

Now, let's go back to page 310 for a moment. Just hold it there for just a second.

A. Yes.

Q. Now, in connection with these conditions, these lesions, and causation, I take it that one important thing to find out would be what happened to the lesions if you quit the habit.

A. That is right.

Q. And if you found that you quit the habit and the lesion regressed, then that would be significant?

A. That would be significant.

Q. And by regressed I meant just went back to

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normal. That's what you mean by regress?

A. That's what we mean by regress.

Q. When in this report you used the word "regressed," you mean that the lesion in effect disappeared?

A. That is what it means, yes.

Q. All right.

Now, if chewing causes the lesion and if you stop chewing, a certain percentage of the lesions regress, that's important evidence on the causation issue? That confirms your theory that it causes it?

A. Right. If we know that these people have stopped their habit and their lesions have regressed, that's a very important piece of evidence.

Q. Very important.

A. Yes.

Q. Now, what if they continue their habit and the lesion regresses?

A. So what then?

Q. Well, does that mean anything?

A. No.

Unless we know how many lesions are -- one has to have two groups for comparison.

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If we know how many persons had to -- who did not change the habit, among them how many regress and among those how many who changed the habit the lesions regressed, until we know that how can we have anything on the causation issue. Just that among chewers so many lesions regressed and among chewers so many lesions appeared, the natural history of lesion could be different in different tobacco habit group. That's what it might suggest.

Q. If you quit and the lesion regresses --

A. Yes.

Q. -- that confirms the theory that the lesion was caused by the habit, tends to confirm it.

A. Yes. And it has to be compared with whether the lesion regresses or not regresses when the habit is not quit. One cannot look at only one, when the habit is not quit.

Q. But if it regresses without quitting, then that means nothing?

A. If it regresses without quitting the habit, we do not have anything to compare it with.

Q. Well, if the habit causes the lesion what causes it to regress if you continue the habit?

A. We do not know.

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Q. Don't know.

A. We do not know.

Q. Well, isn't it true, according to your table 30, that in the ten-year follow-up in the E district on preleuokoplakia that 53 percent regressed with a chewing habit?

A. That's right.

Q. Is that correct?

A. 53 percent of leukoplakias among chewers regressed.

Q. Even though they continued to chew?

A. Yes. In this particular -- in this particular chapter I have not analyzed the changing habit, yes. I think some indication about the change in habit is given in the second chapter, that is the Dynamics -- third chapter, I'm sorry, which is Dynamics of the Tobacco Habit. That might give some information about what kind of habit and in what quantity, in what amount they would quit.

Q. Tell me what page you are on.

A. I'm on Page 294 now. And I'm looking right now at the table 4. In this table I find that 179 had quit their tobacco habit. Among these 179 there were 104 chewers, 68 smokers and 7 with both

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habits. Yes.

So there is some amount of changes in the habit which is going on but that is not correlated with here exactly with the change in the lesion.

Q. Well, are you saying that the lesions that regress were because they quit?

A. I'm not saying that.

Q. Oh.

A. I'm just pointing out the data. There is some data which shows that the habits were not identical during the ten years. Some people had quit their habit. Some people had changed their habit. Here what I'm referring to is a chewing habit, is a chewing habit in the first baseline survey.

Q. Would the finding of whether or not a lesion persisted with a chewing habit or any habit be indicative of causation?

A. Yes. That would be a very important piece of evidence, as I said. If we compare that if a person has continued with chewing habit and if the lesion persists and if he has discontinued the habit and the lesion regresses, that is a very important

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piece of causation, and as a matter of fact we have published that in one of the papers. That that is one year after the intervention study which shows, to be exact, -- this is a paper which is entitled, "An Intervention Study of Oral Cancer and Precancer in Rural Indian Populations, A Preliminary Report," published in the Bulletin of the World Health Organization, Volume 60, page 441, 446, in 1932. The paper shows that in all the three areas, among the people who reduced or stopped their usage of tobacco, the regression rate of oral leukoplakia was significantly higher than among the individuals who did not stop or reduce their tobacco usage.

Q. Do you happen to recall what the percentage was for those who quit?

A. Yes. It is -- it is right here. It's 1.9 percent who had stopped in E district, 2.1 percent in Bhavnagar district.

Q. 4.9 percent in S district.

(Brief recess.)

Q. I would like, if we may, Doctor Gupta, to look at page 310 of your follow-up report. I'm referring to table 30.

A. Yes.

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Q. As stated in the text of chapter 7, preleuokoplakia --

A. Yes.

Q. -- only 7 percent of the preleuokoplakia in the chewing habit group persisted. Did I read that correctly?

A. You are reading table 30?

Q. Sir?

A. You are looking at the table 30 on page 310?

Q. Well, I'm looking at table 30 and above that in the text it says, in the middle of the right-hand column, "Only 9 percent of the preleukoplakia in the chewing habit group persisted." If you look at the chart, that's borne out by the table, is it not?

A. Yes. Okay. Preleukoplakia, that's right.

Q. Then it goes on to say, "In the smoking habit group 42 percent of preleukoplakias persisted without any change"?

A. That's right.

Q. Now, I think we agreed that whether or not the leukoplakias persist if you continue the habit

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is of some significance, have we not?

A. Yes.

Q. And here we find that the persistence was low in the chewing group and high in the smoking group?

A. Yes.

Q. All right, sir.

If we look at the next chart, on preleukoplakias in the ten-year follow-up study in the B district --

A. Yes.

Q. -- we find that no leukoplakias persisted in the chewing habit group and that 7 regressed in the chewing habit group.

A. That's right.

Q. Right?

A. There were only a total of 7 leukoplakias in that district.

Q. So all of the leukoplakias in the chewing habit group were gone?

A. That's right.

Q. Is that correct? 100 percent regression?

A. That's right. Of only 7 cases.

Q. Sir?

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A. But only of 7 cases.

Q. Yes. Only had 7 cases and they all regressed although the habit was continued?

A. We do not know exactly whether the habit was continue, but yes, in absence of that information.

Q. Well, there's always a possibility that the information you got wasn't accurate; is that right?

A. No. What I'm saying is that these -- I have -- in this particular table we have not put down whether the habits were continued or discontinued. So this is all our chewing habit group in the baseline survey. Among them the 7 leukoplakias which were diagnosed and followed up, all of them decreased.

Q. All of them are gone?

A. All of them are gone, yes.

Q. And then if we look at table 32 on the same page for preleukoplakias in the S district --

A. Yes.

Q. We find that two persisted?

A. That's right.

Q. And five regressed?

A. That's right.

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Q. Which gave us 71 percent regressed and 29 percent persisted?

A. That's right.

Q. Now, you were very careful to point out in the text that there were very few preleukoplakias associated with the chewing or the mixed habits and most of these showed regression.

A. Yes.

Q. Did you feel that that sort of helped your position any with regard to causation?

A. Let me put again myself clear. When I was talking about -- when I talk about causation I speak of the body of evidence, the whole body of evidence. I'm not speaking of one specific fact or observation. So this by itself does not really prove or disprove any causation.

Now, we can look into this observation by itself and see what does it mean. To me this observation means that the natural history of preleuokoplakia and leukoplakia is different in different tobacco habit groups. It is not the same. The incidence rates are different, the persistence rates are different, the regression dates are different, even the malignant transformation rates

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are different. So we are dealing with a lesion and condition which has a different natural history depending upon --

Q. I gather that you are in effect telling me that whether it persists or regresses in a habit group and assuming that the habit is continued means nothing whatsoever; is that correct? As far as causation is concerned.

A. If -- unless we compare with another group where the habit was given up or discontinued and what was the persistence and regression rate in those groups. Unless we make that kind of a comparison, it does not mean anything with regard to causation.

Q. Did you make that kind of comparison?

A. Yes, I did.

Q. Where did you make it?

A. That was made in the intervention study.

Q. What --

A. I said -- I refer to the paper in the Bulletin of the World Health Organization.

Q. I see. This is -- some

A. This is some other paper, not this

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paper.

Q. Okay. Thank you.

Now, I didn't really mean to stop without completing my chart out there, so let's go and let's take the B district, and about page 43, I believe, table M on page 43, we show that the chewing habit was practiced by 11.7 percent.

A. Yes. That is the B district. 2.7 percent.

Q. The smoking habit by 29.1 percent.

Then if we go over to the BS and look at page 105, and we find that the chewing habit was 21.5 percent and the smoking habit was 26.7 percent.

Then if we go over to the BD, and look at page 116 and we find that the chewing was 16.5, and the smoking was 35.2 --

A. 33.2.

Q. You are right. It's 33.2. Excuse me. I want to ask you now, if you don't mind, to draw a line that will put the 46.2 below those other smoking figures because it's reversed smoking. Do you see what I mean?

A. Yes. Like this?

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Q. Yes. That's right. And draw it on the cross on both ways?

A. That's right.

Q. That's right.

A. There is a smoking figure for this also, I believe.

Q. Pardon?

A. There should be a smoking figure for this. Do you want to put that?

Q. Yes. Let's see. For S? I think -- maybe most of the smoking was reverse smoking.

A. No. There are two headings: Reverse Smoking and Ordinary Smoking. That is on table 38, page 85.

Q. Yes. We do have ordinary smoking, sure do. That's 16.8. Thank you.

Now, let me refer you again to the B area and -- I'm sorry. Give me just one second.

Yes. Let's look at page 106.

A. Yes.

Q. We're talking now about the BS code; is that correct?

A. Yes.

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Q. And under oral cancer --

A. Yes.

Q. -- no case of oral cancer was found in the district either clinically or after histologic examination?

A. That's right.

Q. In that we read leukoplakia among 10,048 individuals examined, leukoplakia was diagnosed only among nineteem individuals, which gives a prevalence rate of .2 or two-tenths of one percent.

A. That's right.

Q. Among five individuals leukoplakia was associated with other lesions, mainly preleukoplakia.

A. Yes.

Q. So that would be, I assume, five of the nineteen?

A. Yes, sir.

Q. All right.

Now, that is the district -- is a district in which 21.5 of the percent of the people were chewers?

A. That's right.

Q. Which is the second highest --

A. Yes.

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Q. -- chewing district of the five.

A. That's right.

Q. And is that also the area where the quid is held in the lower labial groove?

A. Yes. It is -- yes. This is really a borderline between Bengal and Bihar, the two states. And quid is a kind of mixture. It could be placed generally in the lower labial mucosa. Some people kept the quid on the tongue also.

Q. When we talk about the lower labial groove we're talking about the area in front of the teeth; is that correct?

A. Yes.

Q. The lower teeth?

A. Yes.

Q. When we talk of the buccal groove, that's back in the cheek area one side or the other.

A. Yes. But a lot of people in this area also placed quid in the buccal groove. As I said, this is a bordering area. It borders Orissa on south and borders Orissa on the east, it borders West Bengal. It's -- whereas in that other district, BD, most of the individuals would keep their quid, tobacco quid in the lower labial groove. In this

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district it's kind of a little mixed up area.

Q. Well, regardless of where they kept it, 21.5 percent of them had a quid somewhere and they didn't develop any cancer?

A. That's right. I would not say that they did not develop any cancer. At the point in time we examined them, none of them had any cancer.

Q. You didn't find any if it was there?

A. Yes. That's right.

Q. And only nineteen out of over 10,000 were diagnosed as having leukoplakia?

A. That is right.

Q. And 21 percent of 10,000 -- 21-and-a-half percent of 10,000 would be 2,150 roughly, wouldn't it?

A. I --

Q. 21 percent of 10,000 is roughly -- well, 21-and-a-half percent of 10,000 is exactly 2,150?

A. Yes. The numbers are there in table 36. There are 1,219 chewers who chewed tobacco, 41 chewers who chew without tobacco, and 332 use a substance known as gudakhu. We had put in the chewing habit because for the first time -- We had never heard of gudakhu. We heard of it when we went

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there. It is like a paste really, it contains tobacco. They use it for cleaning teeth.

Q. Is that mishri?

A. No. That's not mishri. Mishri is a powder --

Q. Burnt tobacco?

A. Burned tobacco. Dry roasted. This is in a form of paste with some sweetening agent, jaggery and something. We didn't know where to put it so we put it under chewing habit. But it's not really a chewing habit as such. It's an application of a substance containing tobacco.

Q. It's not a quid?

A. It is not a quid, no.

Q. Let's look again at BD. Now, in that district on page 117, the BD code, out of 10,340 people examined you found one oral cancer.

A. That is right.

Q. Which was clinically diagnosed in a male aged 45 years. Cancer was widely spread encompassing the lower labial mucosa, the buccal mucosa, the floor of the mouth and the aveolar ridge. He had the mixed habit of tobacco chewing and bidi smoking.

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A. Yes.

Q. There you certainly couldn't say that his cancer was where he held the quid. By the time you all saw it it was all over his mouth?

A. Yes. By the time we got to see him, his cancer was all over the mouth, yes.

Q. You don't know where it started in the mouth, where the first place was?

A. No.

Q. Do you know whether it had spread or whether it had started anew at each of these places?

A. In this particular case I would not know. It's probably there somewhere in our records.

Q. Okay.

Then we go on down under leukoplakia and we're still talking about the BD district.

A. Yes.

Q. We see that leukoplakia was diagnosed among 22 individuals.

A. Yes.

Q. Which gives a prevalence rate again of .2 percent.

A. Yes.

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Q. Two-tenths of one percent.

A. Yes.

Q. And among three individuals leukoplakia was associated with other lesions, namely preleukoplakia?

A. Yes.

Q. So you had a very low incidence of leukoplakia both in the BD and the B district; is that correct?

A. I would use the word "prevalence." These are prevalence studies, not incidence studies.

Q. I'm sorry. I'm having trouble.

A. I would use the word "prevalence" rather than "incidence" because these are prevalence studies, not incidence studies.

Q. If you look at page 119, Correlation with Habits.

A. Yes.

Q. It says that "The correlation of leukoplakia with habits shows that two leukoplakias were found among individuals practicing chewing habits without tobacco. Due to the low percentage of the individuals practicing chewing habits without tobacco, this gives a large percentage of leukoplakia in the chewing without tobacco habit

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group."

A. That's right.

Q. Among all other habit groups, the prevalence of leukoplakia was almost the same except for hooka smokers; among hooka smokers no case of leukoplakia was diagnosed although 14.2 percent of the population was practicing hooka smoking?

A. That's right.

Q. Is hooka that the hot clay pipe?

A. No. Hooka --

Q. That's hookli.

A. That's hookli.

Q. What's hooka?

A. Hooka is hubble-bubble, where the smoke passes through water. Hubble-bubble.

Q. I've done it. It's good smoking.

I'm about ready to stop for the night but I want to ask you about one other thing before I do because I think I can do it very quickly.

Doctor Gupta, you were involved in a follow-up study on oral leukoplakia with regard to Bombay policemen, were you not?

A. Yes. That's right.

Q. And I believe that the original study was

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performed in 1959?

A. Yes. I was not involved with that study.

Q. You were not with that. There was a follow-up in 1964.

A. Yes.

Q. You wee not involved in that, but there was another ten-year follow-up in '69 and you were involved with that?

A. That's right.

Q. And that one I think, Doctor Mehta was sort of the principal lead dog in that?

A. That's right.

Q. That is right?

A. Yes.

Q. Now, it was found from the five-year follow-up that there were no leukoplakias that had become cancerous in five years.

A. Yes.

Q. So that gave you a rate of malignant transformation ranging -- from -- in the range of nil; is that correct?

A. That's right.

Q. So that didn't confirm the idea that

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leukoplakias changed into cancers, did it?

A. That's right. That did not provide any evidence for that hypothesis.

Q. It didn't what?

A. It did not provide any evidence for that hypothesis.

Q. Okay.

This particular group was considered to be a fairly -- a very good group for study, was it not?

A. What exactly do you mean by --

Q. You say in the report that "This study differs from others so far reported in the literature in that the group of subjects includes persons with and without lesions and with and without tobacco habits and a whole group is being re-examined without the introduction into it of any element of selectivity."

A. That's right.

Q. Now, that's the kind of study that you would say had a high degree of reliability, would you?

A. Yes.

Q. And I believe you started out with 4,734

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men.

A. Yes.

Q. And the first five-year follow-up you had 3,785 men.

A. Yes.

Q. And then after ten years from the first examination --

A. Yes.

Q. -- five years after the second, 3,674 of them were re-examined.

A. Yes.

Q. That's correct, is it not?

A. Yes.

Q. All right.

And you found that among 200 -- this is on page 428, the last full paragraph. "Among 205 leukoplakic lesions diagnosed in 1964 and re-examined in 1969, 85 (41.5 percent) were seen again, whereas 87 (42.4 percent) had regressed to normal."

A. Yes.

Q. More of them had regressed than persisted?

A. That's right.

Q. You also found that "With regard to the

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behavior of leukoplakic lesions in relation to habits," and I'm now at page 429, "the five-year and ten-year incidence were least in the no-habit group and the maximum in the mixed-habit group"?

A. Yes.

Q. "The incidence was higher among smokers than among chewers. Persistent lesions were practically absent among chewers."

A. Yes.

Q. And 61 cases of leukoplakia were found to have regressed in the chewing habit group.

A. That's right.

Q. Then the table that shows the number of persons in different habit groups in 59 and 69, one can see that in the no-habits group there is a decrease, whereas in all the other groups there is an increase in the number of persons. The highest percent increase is found among cigarette smokers.

A. Okay. Right.

Q. I'm sorry. That's in the middle of page 430.

A. Okay. Yes. That's right.

Q. The number -- their number being increased by 67.5 percent in ten years.

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A. That's right.

Q. The next highest increase, 8.9 percent, is seen among those with chewing habits.

A. That's right.

Q. Then it refers to bidi smokers increase comparatively less.

A. Yes.

Q. Now, if we go over to page 431.

A. Yes.

Q. 117 men with leukoplakia examined over a period of ten years, one was reported to have developed oral cancer.

A. Yes.

Q. Now, do you find where that oral cancer was and what the man who had oral cancer did or anything of that kind?

A. I remember from a personal memory, I'm not sure whether it is mentioned in the paper or not now, this particular oral cancer was on the tongue.

Q. Was what?

A. Was on the tongue.

Q. On the tongue. What was the habit associated with that?

A. That I do not remember, to tell you

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the truth.

Q. And would I find in this report where that malignancy was? I haven't been able to.

A. Yes. He practiced a mixed habit of ban, b-a-n, that's betel quid, chewing and bidi smoking and his age as reported in 1959 was 39 years.

Q. Where are you looking, please, sir?

A. I'm looking on page 428 about, I think, seventh line from the paragraph results.

Q. Okay. I see.

It does not show in that where in the mouth the lesion was that developed cancer?

A. Yes, I think -- yes. I know why it is not there. Because he had died of oral cancer in the intervening period, so we could not examine him.

Q. Well -- you didn't get any information as to where it had been?

A. No. We know -- I know it was on the tongue but we did not put it down.

Q. But it's still not in --

A. It's not in the report, no.

Q. Now, this may or may not be interesting, it is to me, I notice that you had four people who died of malignant diseases other than oral cancer during

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that period.

A. That's right.

Q. What kind of cancer did they die of?

A. At this stage I have no --

Q. You do not know?

A. I do not know. I don't remember.

Q. What caused those four cases of oral cancer -- I mean of cancer other than oral cancers?

A. What causes cancers other than oral cancer?

Q. What caused the death of those four people who died of cancer that wasn't oral cancer?

A. You mean whether I --

Q. You don't know, do you?

A. Did I look at the death certificate? No, I did not look at the causes of death of --

Q. Do you think if you had looked you've have been able to find out what caused their cancer?

A. In an individual person, again as I said, in one specific person I cannot tell anything. Okay? What I say always is about groups of individuals. For one person I can only say the fact.

Q. That they died and they had cancer and that's all?

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A. That's all.

Q. In the summary of page 433 the report says with regard to these policemen, the last -- next to the last sentence, "It was observed that almost all leukoplakic lesions in the chewing-habit group regressed, whereas most leukoplakic lesions which persisted for ten years were in the smoking-habit group."

A. Yes.

Q. Is that correct?

A. Yes.

Q. That's what you found?

A. Yes.

Q. We'll take a recess at this time.

(Whereupon, at 4:10 p.m., the deposition recessed until 1 o'clock Friday, May 10, 1985.)

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I have read the foregoing transcript of testimony and the same contains a true and accurate record of my answers given to the questions therein set forth.

_____

PRAKASH CHANDRA GUPTA, Ph.D.

Subscribed and sworn to before me this day of 1985.

_____

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CERTIFICATE

Commonwealth of Massachusetts
Suffolk, ss

I, Rebecca L. Bissonette, a Notary Public in and for the Commonwealth of Massachusetts, do hereby certify:

That PRAKASH CHANDRA GUPTA, Ph.D., the witness whose deposition is hereinbefore set forth, was duly sworn by me and that such deposition is a true record of the testimony given by the witness.

IN WITNESS WHEREOF, I have hereunto set my hand and notarial seal this 31st day of May, 1985.

Rebecca L. Bissonette

REBECCA L. BISSONETTE
RPR/CSR

My Commission expires:

June 1, 1990

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